WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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PROPER HEIGHT FOR MECHANIC'S VICE.

BY H. B. PILKINGTON.

If men were all of the same height there would be no difficulty in regulating and determining the right height of the carpenter's bench and the mechanic's vice, for it would be easy enough in each case to arrive at a standard which would serve equally well for all. There is, however, a considerable difference in the stature of men, some being above and some below the average height, and as work at the bench and vice has to be done by the workman when standing, it is manifest that a tall man would be compelled to stoop too much when working at a bench or vice of suitable height for a short man; and a short man obliged to stand upright and raise his arms to an inconvenient height if put to work at either appliance at which a tall man could work with ease and comfort. Without doubt a great many amateurs, and, possibly, not a few intelligent and skilful professional workmen, would be puzzled to give with promptness a direct and satisfactory answer to the question: At what height from the ground should the jaws of the ordinary mechanic's vice be placed? To such as are ignorant, or perhaps in doubt, on the point, the accompanying sketches will be helpful in fixing on both mind and memory the right solution of the problem. For the sake of comparison, four have been given. In Fig. 1 the vice is too low, and the workman has to bend his knees and stoop too much over his work, and thereby loses power. In Fig. 2 the vice is too high, and this compels the workman to assume too erect a position and raise his arms too high, and in this case also power is lost. In Fig. 3 the vice is just at its right height, midway between the too low position in Fig. 1 and the too high position in Fig. 2; and the position assumed by the workman is such as enables him to bring the whole weight of the body, or nearly so, to bear on the stroke, and thereby the power exerted is at its maximum. How is the proper and most convenient height for each workman to be obtained? This is answered by Fig. 4, which shows that, to suit the workman, the top of the anvil should be just high enough to touch his elbow when he stands erect and bends his arm as drawn.

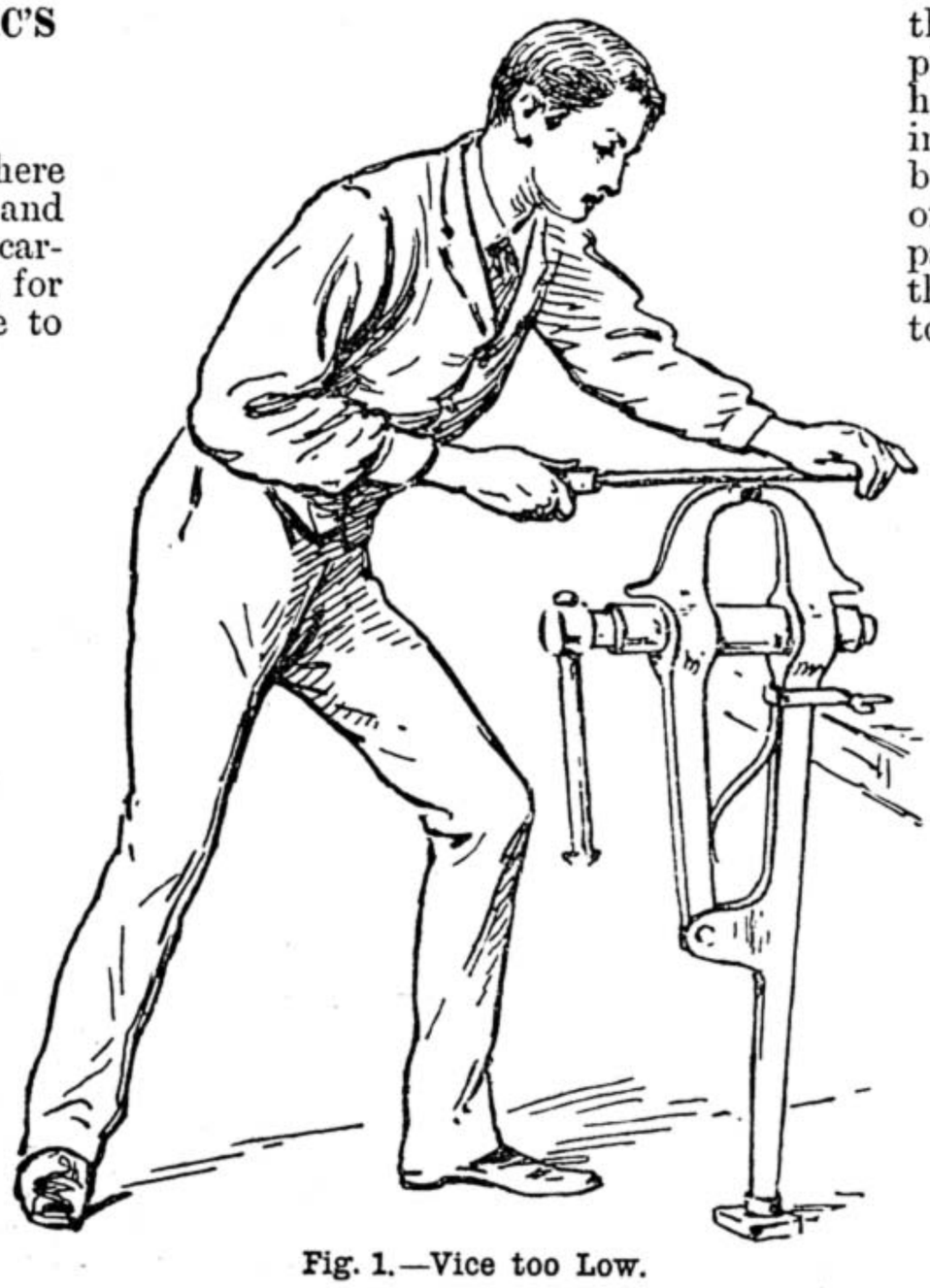

Fig. 1.—Vice too Low.

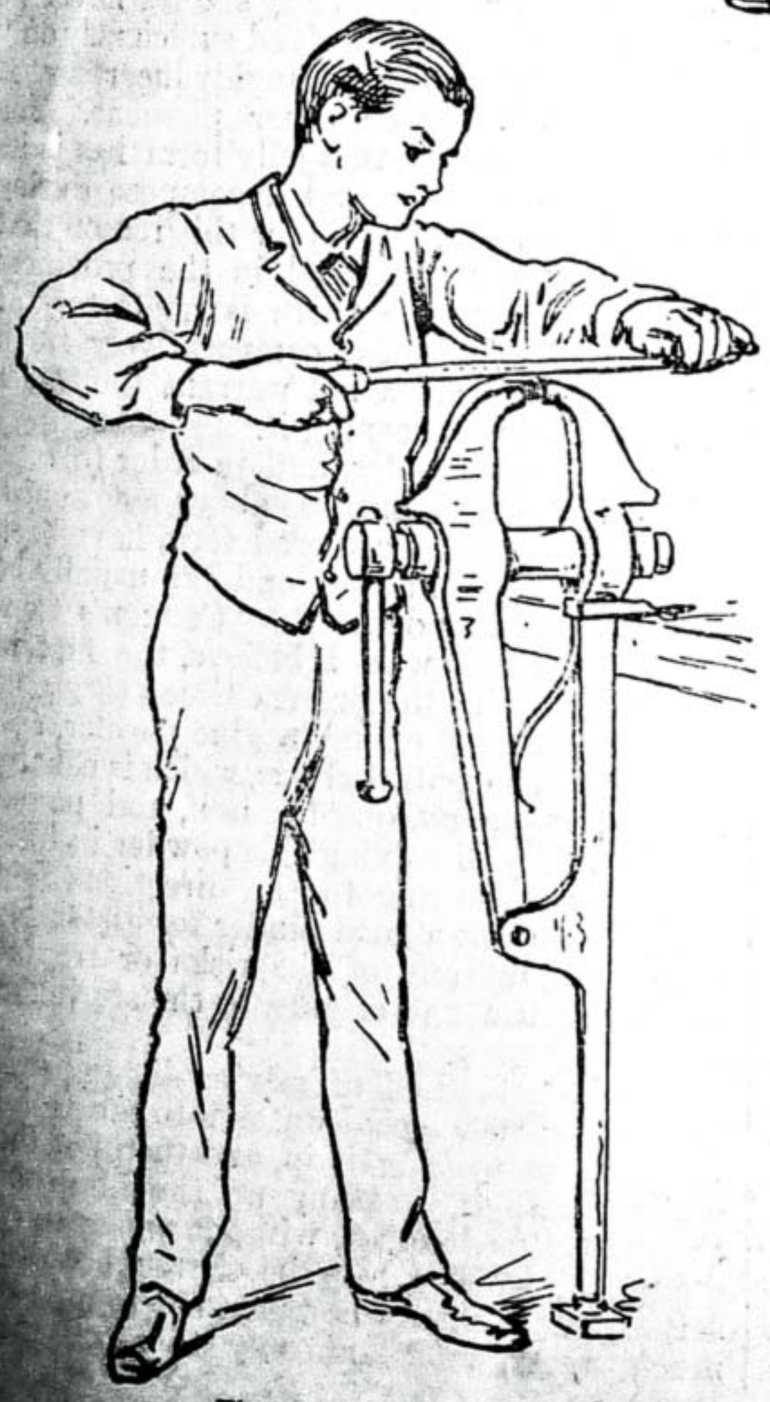

Fig. 2.—Vice too High.

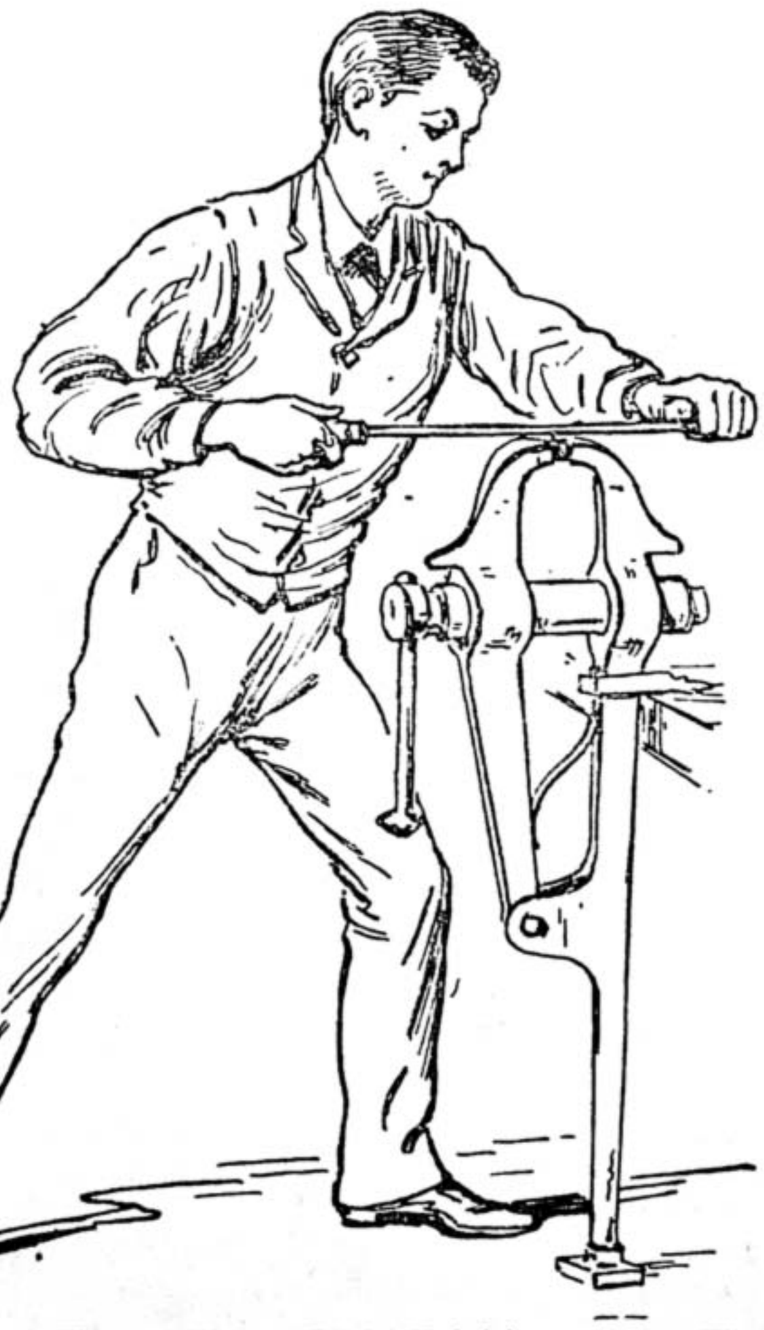

Fig. 3.—Vice at Right Height.

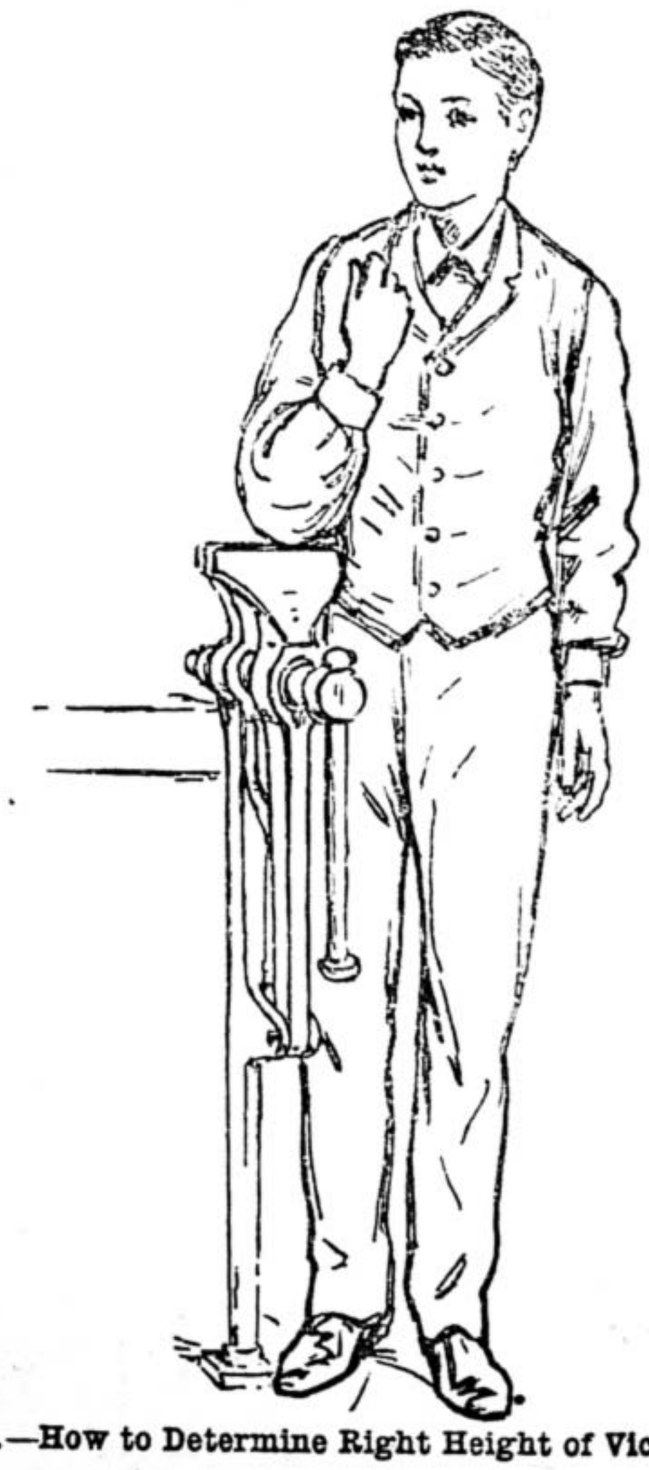

Fig. 4.—How to Determine Right Height of Vice.

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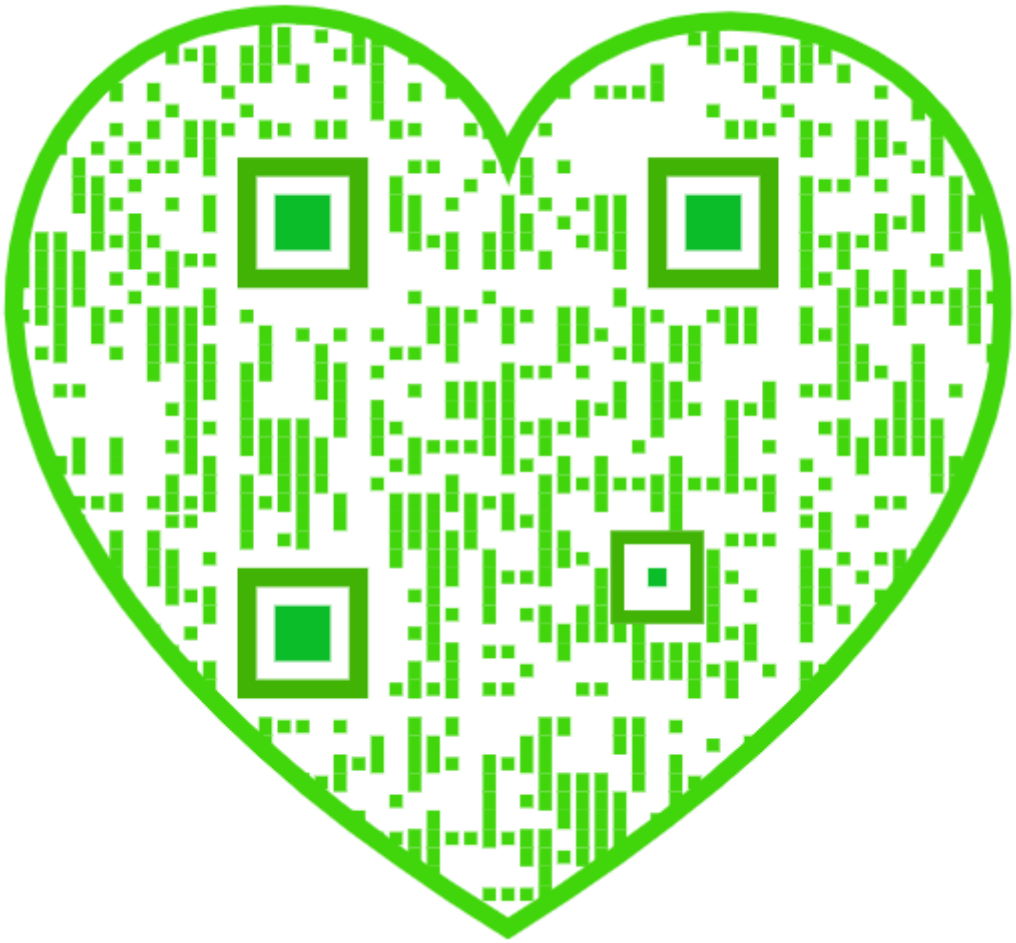

PLAIN AND DECORATIVE HOUSE PAINTING.

BY A LONDON DECORATOR.

DISTEMPER OR TEMPERA PAINTING.

IN writing technical papers upon house painting, and indeed upon most trades and callings, there are many words and expressions used in connection therewith that the writer always feels require but little explanation other than the words themselves convey. "Oil paint" and "varnish" for instance are examples of such. Upon the other hand it is very desirable that words of a more complex nature—notwithstanding their meaning may be very patent to most of my readers—should be accompanied, if only for the benefit of a small minority, by a practical knowledge of their proper sphere and use. "*Distemper*" is, certainly, a word of this latter kind; for although the process of *distempering* is familiar to all of us, I suppose, in its most elementary form of "whitewashing," the word has a distinct interpretation in its connection with the brightening and embellishing of our buildings.

Briefly, its Italian derivation, of *tempera*, gives at once a key to its meaning, when compared with the word "tempering," *to temper*, *to work up*, or *to mix*. Notwithstanding this mixing, or tempering, is a process common to all painting, oil and otherwise, *tempera* is the recognised name for *water painting*, that is to say, the compounding and spreading of *opaque* solids and pigments with water for the solvent, and some suitable *vehicle* introduced to bind the particles together.

At the present time, in which it is our privilege to be workers, the qualities and cheapness of distemper make it as invaluable a servant of the decorator as are oil and flatting paint. For preservative purposes, and as a covering for surfaces exposed to our humid atmosphere and weather, distemper is, however, practically useless; and although under fair conditions it will stand much "wear and tear" on walls, it is principally for situations out of reach and beyond abrasion that it is used with more advantage than oil paint. The most satisfactory purpose to which we can apply either oil paint or distemper will readily be apparent if we consider their totally distinct qualifications and nature. In the former mixture we know that whilst the linseed oil is the *solvent* it is also the *binding* factor, driers being added merely to hasten and accentuate the hardening. On the other hand, in distemper colour, the solvent, namely, water, has no such permanent action as has the oil in the former, but is entirely dispersed and carried away by evaporation.

Distemper, it therefore follows, besides being prepared from dry pigment and with water added to enable us to manipulate the former, requires a third and highly important factor which shall of itself bind the particles together and maintain this action when evaporation is complete.

Having, satisfactorily I hope, now explained the term, and also the nature of, *distemper*, we will consider separately the solids and the binding factors which are necessary to preparing it; concluding my paper with instructions for mixing and using it for general purposes.

In both oil and distemper painting there is one item, or rather substance, which ranks pre-eminently for its purpose above all other pigments. In the former process this position we know is held by the ordinary *white lead*, and other similar *carbonates* known as "Flake," "Nottingham," and "London" whites, etc., but which latter are seldom required for ordinary house painting. Mother Earth favours us even still more for *tempera* painting, providing us with an unlimited store of limestone and chalk, from which we derive the ordinary lime, *oxide of calcium*, of building processes, and a further preparation known as *carbonate of lime*.

Whiting, or *whitening* as it is sometimes termed, is the most ordinary and also the most useful form of carbonate of lime. *Paris white* and *gilders' whiting* are the best qualities of the same article and differ from the cheap kind in fineness of substance and purity of white. *Paris white* is in far greater demand in the United States of America than in this country, where, under the term of "*Kalsomining*," the practice of whitewashing is carried to perfection. Repeated grinding and washing are resorted to in order to convert the chalk into the condition of whiting, the processes being worked to extremes when the finer qualities of the above-mentioned are required. For the practical benefit of the young learners amongst my readers, I may mention that Paris white is usually sold in a loose or powdered form, whilst gilders' whiting is commonly dried in the form of large knobs, each weighing three and four pounds, and being therefore about twice the size of the cheap knobs of "oil-shop whiting."

Whiting that has been properly washed and prepared, will easily break in the hands by pressure of the fingers, and there should also be a total absence of grit and sand. If it does not crumble up and dissolve easily, we have evidence that insufficient washing has left objectionable traces of a binding nature, common to lime.

I have gone somewhat minutely into *whiting*, and its desired condition and qualities, with good reason, however, for upon its purity much of the permanency and beauty of our *tints* of distemper will depend. Whiting which contains grit is entirely useless for gilders' work, namely, the preparation of surfaces for *water-gilding;* whilst if present to any extent in our distemper, grit will settle to the bottom of the vessel and, what is more troublesome, often carry with it the bulk of any powdered pigment used for tinting or staining purposes.

It is not my purpose herein to consider exhaustively every description of *vehicle*, ancient and modern, that has been, or can be, used for binding or cementing the particles of whiting or pigment to each other and, collectively, to the surface our distemper is applied on, but to notice the best and most convenient preparations of "to-day."

Until recent years, the ordinary glue of commerce was the only serviceable "binder," or water-vehicle, that house painters could conveniently use and obtain for making distemper. To the present day glue is still largely used in the provinces and places remote from the larger trade circles. The usual mode of preparation is to soak it in cold water over night, and then by breaking it up with the hand, or the application of heat, to convert it into a liquid or jelly form, when it is ready for adding to our whiting. The chief and only advantage of thus using and preparing glue lies in being able to stock it without detriment to its service ability. In London, Manchester, and, in fact, all large towns, glue for distemper purposes is now entirely superseded by a jelly substance of similar source and nature, termed "size."

The nature and preparation, of *size* is almost identical with that of glue. The hoofs, hide-clippings, and other refuse of the tanyards is the source from which they are prepared, both being a gross kind of gelatine. The substances mentioned are purified with lime, and then the gelatinous matter extracted by gradual boiling, and the clarified condition of this extraction is the *size*. When required to be converted into glue, this liquid, after the greater portion of the water has been evaporated, cools into a very strong jelly. It is then divided into blocks which are ultimately converted into cakes of hard glue by a double process of drying by natural and artificial methods.

Clear, or *gilders'*, *size* is a simple decoction made by simmering "parchment cuttings" in a vessel—preferably with an enamelled inside—until the gelatinous "virtue" is all extracted therefrom. It is then poured off in its liquid state and strained through fine muslin, and when cool is almost colourless. Gilders—I mean those who are masters of every branch of this craft and follow it entirely as their trade—always prepare their own clear size; and as this article is one of the most important used in all water-gilding processes, knowledge of and practice in preparing it are very essential to such work. *Clear size* is also used for finishing decorative "oil gilding" in buildings, etc., hence this knowledge should be common to the decorator also.

Painters' size is usually sold by the pound weight, or in firkins containing about 28 lbs. The finest and whitest variety, used in London and district, is known as "Young's patent size," which for purity and strength is equal to anything that can be produced. *Double size* and *extra double* are the two varieties most used for distemper, the latter being the strongest; neither of these are, however, to be compared with the first-named for purity and translucency, their colour being similar to size prepared from a good quality of ordinary glue.

When required for use these jelly sizes are put into a vessel and dissolved by heat, a little water being first introduced to prevent them from burning. Size should never be made very hot, but dissolved sufficiently only to allow of its being thoroughly incorporated with the whiting or other pigment. The only disadvantage the jelly form has is its liability to putrefy and decompose during the hot weather. It is for this reason that glue is often substituted in the provinces and districts where there is no factory at hand, and where the comparatively small demand for it does not warrant the trader or house painter keeping it.

Still more recently, and in order to cope with the disadvantage above-mentioned, glue and size in a powdered form have been placed upon the market, and can usually be obtained in any district. "Cannon's Concentrated Size" was, I believe, the first in the field, but at the present time every glue and size factory makes a glue powder, size powder, or concentrated size, which is usually retailed in penny, quarter, half, and pound packets. By dissolving this powder in boiling water, according to the directions sold with it, we get a good binder for distemper work without any of the risks or trouble attending the use of glue, or the storing of size.

The best method of mixing distemper is to first put some cold water into the vessel we purpose making it in, and then put the whiting into it, breaking up the lumps at the same time, so that, without unnecessary delay, the whiting may be thoroughly dissolved. Care should be taken not to use too much water, sufficient only to cover the

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whiting being required. When properly "slacked" and settled down, the surplus water must be gently poured off. A careful worker will then thoroughly stir the whiting to ensure its all being properly dissolved, this being best done by the bare hand and arm, and, gently pouring in his warm size, will continue to stir and mix until the two constituents, size and whiting, become thoroughly worked together. This should now be set aside in a cool place, when it will gradually assume a white jelly form. The amount of melted size used would be about half the bulk of the soaked whiting, but should there be an excess of water in the latter, it often so dilutes the size that there is not sufficient strength contained in the whole mixture to gelatinise or set it. Some of my readers may feel that this simple pail of whitewash requires more care than was anticipated, but good work cannot be done without properly prepared material. For the very common kinds of whitewashing, on country cottage ceilings, etc., it is very often the case that the housewife brushes the surface over with whiting and water only, just as lime is used for "white liming." No solid appearance is possible with such, however, and although for ceiling work in general less proportion of size than that given above can be used, jelly distemper works far easier, presents a more solid appearance, and is manipulated with far less splashing and mess than is usual with the watery wash we often find used by others than country housewives.

Those of my readers who have studied the previous papers on oil painting, will have in their mind how far the condition of the surface to be covered affects our proportions of material in that process. The same principle underlies both oil and distemper work; and the success of the latter will greatly depend upon the preparation of the plaster work. In describing the nature and necessary manipulation of flatting paint, I have also shown that no "break" must be made in a piece of continuous work, or flank of wall, but that every surface complete in itself, like a ceiling-flat or side of a room, must be commenced and expeditiously completed without join or "miss." We must therefore ensure a uniformity of absorption, or rather non-absorption, by previously coating the plaster with a mixture, which, like the first thin coats of paint in oil painting, shall stop the unequal suction common to all such plaster-work.

For this purpose the most convenient preparation is strong jelly size diluted with about one-third of water and just sufficient whiting to colour, without practically thickening, the size. This clear-coat, or "clearcole" as it is termed, should be prepared in precisely the same manner as the finishing distemper, and when convenient the addition of a little alum is desirable. The hardening action of alum on substances of a gelatinous nature is well known, especially among those of my readers who know what a photographic dry-plate is—not a few, I am sure! The introduction of the alum is not obligatory; the strong size and whiting alone will suffice, and this should be applied warm, as soon as mixed, for when cold it would be too stiff to spread with the brush. No such precautions concerning joins and streaks are required for using clearcole, since there is not sufficient body in it to form an appreciable incrustation on the wall. The size soaks into the face of the wall, and when dry is ready for finishing upon.

When distempering or tinting, that is, with tinted distemper, a ceiling of any dimensions, it is advisable to have a scaffold to work from, consisting of a plank resting upon two pairs of steps or, preferably, trestles made for that purpose. All cracks in the plaster should, if at all bad, be first "cut out," the face of the plaster each side cut away for half an inch, and then finished to a level surface with plaster and a small trowel. A broad, thin piece of wood with a square, bevelled edge is very useful for stopping plaster walls, for many operative painters even, in trying to stop a crack or hole with a sharp steel "stopping knife," will badly scratch the surrounding face of the plaster, the evil result of which is only seen when the job is finished. Repairing should be done on new ceilings before the clearcole is applied, and with old ceilings, at the time they are "washed off"—that is, when the old, dirty distemper is removed with water and brushes.

Ceilings should always be distempered by working away *from* the light towards the door or entrance to apartment. Two men are required to do a good-sized ceiling-flat; they should start at the window end, and, keeping their work in one general line, spread the distemper from the end as far towards the centre as they can both conveniently reach. The scaffold is then brought forward and another "shift" covered, and so on until the whole is finished. The solvent we use for distemper work being water, it will readily be seen that extreme heat or draught of air, such as will evaporate the water, is to be avoided during manipulation; but so soon as a piece of work is completed, our object must be to *dry* it off as *quickly* as possible, and hence open door and window to create the draught we previously had to avoid. A properly executed piece of distempering should have a level, but not perfectly smooth, surface; should show no joins or coarse brush-markings; should have a perfectly "dead" appearance, be solid and uniform throughout, and should, finally, *not* rub off by ordinary wear, or leaning against.

In distempering walls where a good job is required—and this I aim to direct all workers to—the stopping and clearcoling must be carefully performed, and thoroughly dry before the finishing coat, in a nicely jellied condition, is spread. In covering a wall of ordinary height, two workers are necessary, one standing on the scaffold and taking from the top, half-way down, the other working beneath him. It is a good plan for the bottom man to start spreading and keep slightly ahead of his fellow, who then, in his "laying off" strokes, will nicely cover all traces of the join. Distemper neither requires nor allows one-half the manipulation that oil paint does; and, as before mentioned, its nature rather corresponds with "flatting."

The brushes made for distempering, and the proper method of using them, I shall describe in the following paper, and which will cover also, as far as possible, all the tools and brushes used by the house painter.

By far the greater proportion of plaster ceilings are finished with distemper paint. Besides the advantages of cheapness and of covering in one coat where, with oil paint, four would be required, distemper shows superiority in other respects.

In large halls, dining-rooms, and similar places where people congregate, the moisture in the atmosphere—unless the ventilation of the apartment is exceptionally perfect—will condense upon a painted surface and run down the walls. This can be easily noticed by any of us. When distemper is substituted for it in such situations, no unpleasant effect is seen, since the distemper will absorb the moisture for the time being, and ultimately give it forth again without any detriment to its colour.

This property of distemper also points out the necessity of removing all old colouring and whitewash from ceiling and walls, but which are, in some cases, coated over with size, instead of the dirty, unhealthy coating being removed with brushes and water. The size binds the dirt down, and the opacity of distemper paint allows us to do this without its showing the dirt through; nevertheless, it is a practice to be condemned by all who think of sanitation. Doubtless this labour-saving plan would be used to a more general extent but for the fact that continuous coats of distemper and size soon discover the bad worker by the surface cracking and peeling off, owing to excess of size thereon.

In all preparations of paint the purity of our tints of colours is very much dependent upon that of the body pigment used. As good whiting is far more white and brilliant than white lead, it follows that we can obtain much purer and more delicate tints in distemper work than is possible with substances more affected by the atmosphere, as are the carbonates of lead, and oils which contain yellowness. If *gilders'* or *Paris* whiting be used with *clear* or *Young's patent* size, the purity of distemper tints is so very much in advance of those of white lead paint that it is impossible to match them in colour. In desiring our paint to suit the colour of the paper of a room this fact must be borne in mind, and allowance made for it. In such cases, *exact matching* is neither necessary nor possible. Our colours should always be judged by the general or dominant effect, and not by any infinitesimal portion thereof.

Notwithstanding the natural characteristics of distemper are absence of gloss, and suitability solely for interior and unexposed situations, many attempts have been made to combine its cheapness with the permanent qualities of oil paint.

When distemper work was scarcely so ordinary a process as size and size powders and improved pigments have of late years made it, the walls of apartments were sometimes painted in *tempera*, and finished, at some expense, by polishing or "satining" with French chalk and flat brushes. Nowadays, however, it is very seldom done directly on wall surfaces, although a similar process is still used on paperhangings, termed "satin goods." As before mentioned, excess of *vehicle* in distemper, whether gum, glue, or size, causes it to crack and peel off; so that, notwithstanding an "egg-shell gloss" could be obtained were sufficient used, it would only be at the sacrifice of permanence.

Pure beeswax can be added to distemper with occasional advantage for decorating ceilings in tempera. It forms a far harder surface for painting or stencilling ornament upon, without any risk of peeling off. It can scarcely be termed washable, but may be made to stand a considerable amount of wear and cleaning. The mode of preparation is to dissolve the yellow beeswax—not the paraffin-adulterated article—in oil of turpentine by heat, to have one's whiting ready for mixing, then add strong and very hot size, and well mix together before stirring in the melted wax. I do not commend this to the novices amongst my readers; it requires the professional hand to work it successfully.

Mixtures of distemper--that is, size and

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whiting—with "turps," hot linseed oil, Russian tallow, etc., are occasionally made to spread on outside work, and are successful so far as they contain the oil or grease which repels the water. For inside work a washable tempera is impossible from ordinary ingredients and without mechanical processes. There are, however, a few so-termed washable distempers in the market. The best known are J. B. Orr & Co.'s "Duresco" and Griffiths' "Acquol." The former has been much used on such large buildings as colleges and hospitals, but only for interiors. As *washable* paints they are fairly successful, but, since they are prepared from a basis other than whiting, they lack considerably the opacity we can obtain with one coat of good plain distemper.

In tinting, or colouring, distemper, the pigment used for staining, whether ground in water or in powder form, should be mixed with the whiting before the size is added. It cannot otherwise be properly worked into the whiting, and, after the size is added, the distemper should be run through a thin gauze or hair sieve. If it is strained after getting set, this will give it in a very agreeable condition for spreading—"to work like butter," it is termed.

The nature of distemper is such that, when dry, its tints are very much lighter than when mixed. This is due to the action of light upon the solvent—water—used for mixing, and the evaporation of which allows the pigment to convey an equally bright sensation as it did before being so saturated.

The pigments most suitable for staining whiting will be gathered from the opening papers of my subject, but I append a few of the most useful and ordinary:—For *warm*—that is, red—tints, Venetian and Indian reds and burnt sienna. For *buffs*, *cinnamons*, etc., the natural *ochres*, *umbers*, and *siennas* with the above reds. Lime blue and ultramarine, so-called, make blue and grey, with red added for French grey, and *blue-black* or *Paris* black where the neutral is required. Greens are seldom required bright, and mixtures of raw sienna or ochre with lime blue, indigo, or ultramarine are most reliable. All dark-colour distemper paints like purple-brown, for instance, seldom require whiting, only the pigment prepared in similar manner. All mixtures should be tested and dried on paper to allow us to judge the colour, and when this is correct, add the size.

THE BROOCH: HOW TO MAKE IT.

BY H. S. GOLDSMITH.

Brooch Mounts:

THE PRINCIPLES THAT GOVERN THEIR POSITION, BOTH ON THE BROOCH AND WITH REFERENCE TO ONE ANOTHER.

WE have made the different mounts, and now we have to attach them to a brooch. So, if you please, we will consider if there is a proper place for them, and what relation they bear to each other.

I can simplify these considerations, inasmuch as custom decrees that all ladies must be right-handed—at least, we make brooches for them alone.

The poor ladies who are left-handed must be content with insecure fastenings, for, as far as my knowledge goes, they are never considered by us at all in this matter.

A circular brooch (Fig. 1, A) will be the type from which we can point our moral, even if it does not help to adorn a tale.

As the perpendicular lines on the front of the brooch (be they what they may, either ornament or stones) depend on the *position of the tongue*, this must be so placed that it is parallel with the true horizontal line, or, as we say, straight across the brooch, as in Figs. 1, A, and 1, B, but a little above the middle line, else the brooch will topple forward.

To get the tongue right, the joint and

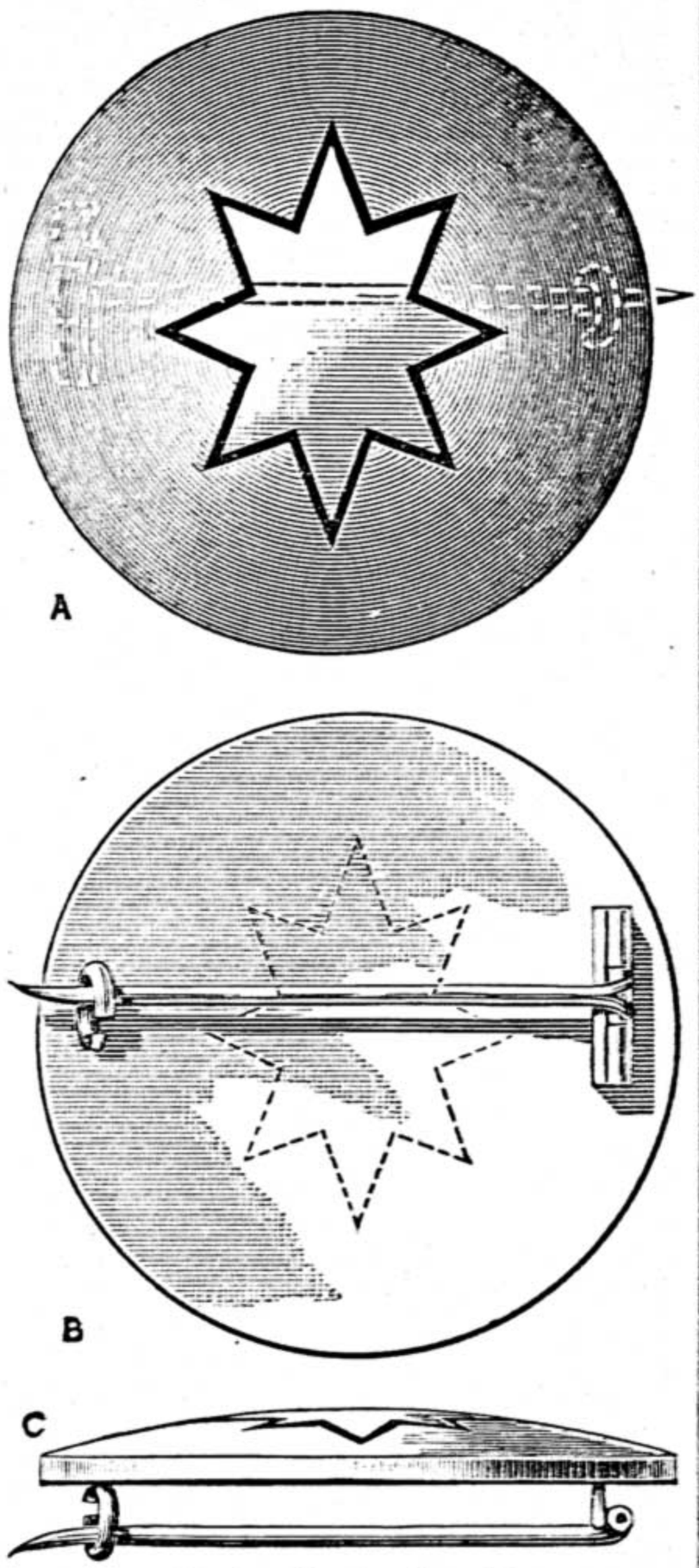

Fig. 1.—Circular Brooch.

The Star in front is to show the horizontal and perpendicular lines; correct position of tongue is shown in A, B, and C, that is, straight across and above the middle line. A, Front view, showing by dotted lines the position of the various mounts as they would appear if seen through the brooch. B, Back view, giving the positions of the mounts; note that the opening of the catch is downward. C, Top view, to show parallel position of tongue when fastened.

Fig. 2.—Form of Double-Pointed Tongue, to prevent tilting forward of Narrow Brooch.

catch have to be properly placed. It is not difficult to see where the centre of the joint should be—as that is in the same line as the tongue—and with the catch there is no difficulty here either, if you remember that the natural spring of the tongue will force it to rest against the highest part of the inside of top curl.

This point being fixed, you have but to solder such highest point in line with the centre of joint.

You will, I feel sure, without being told, solder the joints and catch parallel | thus | and not / thus |.

Besides obtaining the horizontal position of the tongue in reference to the front, we have to get a proper distance between it and the back of the brooch (Fig. 1, C). This distance will vary according to the size of the brooch, and to the material that it will have to fasten; for example, but little space is wanted between them when silk ties or lace is to be secured, while something like ¼ in. may be wanted for a heavy shawl brooch. You will have to judge that for yourselves, as it will probably vary with every brooch you make.

The side view of the brooch (Fig. 1, C) indicates the position that should be tried for: it is, as you see, quite parallel with the back all along.

What should the length of the tongue be?

For the ordinary tongue we have it projecting a little beyond the catch, say ⅛ to ¼ in., and, at the same time, bear this in mind, it *must adjust easily*, therefore don't cut it *too short*, and it should not give opportunities for the wearer to *get scratches*, therefore, *not too long*. You must find the medium; I cannot fix one for you.

You should also turn up the point a little away from the brooch, in order that it (the point) may rest against the dress, and so obtain a little protection.

The length of the tongue in a protecting or safety catch decides itself, for we should never be mad enough to let a tongue project when the catch is made expressly for its protection—should we? Of course, never! Well, perhaps, we had better say hardly ever!

The catch, you will notice, is placed with its opening *downwards*, for a very simple mechanical reason that I leave you to guess for yourselves. If you do not know what it is, just observe the way left-handed ladies put their brooches on, then you will see the insecurity of turning the catch the other way about. I expect a good proportion of us have put a catch on head over heels when we were but young at the trade, and the same thing still happens even now with apprentices, so, kind reader, you are warned: be ready to do this properly when first asked to solder a catch on.

Fig. 2 indicates a suitable way of using the double tongue, for if a narrow bar brooch has a heavy or high front, then it will look towards the ground, and show us its edge instead of its front, unless we take some such means as this to keep it up.

The artistic part of our work I am purposely refraining from making but little allusion to, at any rate, for the present; but this I should like to say, with all the authority that others' opinion and advice and my own experience give: *Learn to draw*, and, if possible, to model in wax as well. For without a knowledge of drawing it is *simply impossible* for you to do your work properly. You have not educated your eyes, and cannot appreciate, and, consequently, cannot reproduce the drawings given to you to carry out.

I could write for hours and give examples without number of the advantages this confers, but I will content myself with asking those who mean to be good workmen to study freehand drawing and geometry during their leisure hours. Go to some art school. There are evening classes held nearly everywhere now, and, at first, keep to simple outline scrolls and leaves: it will give the best results for your business.

I am so convinced of its necessity that I advise the giving up of some hobby or other for this purpose, if you can find no other

time, for if you do not, then in the race to the front you will be left behind.

Drawing is of paramount necessity as a means to convey your ideas or methods, and in this I have our worthy editor's experience to go on as well as my own. And he has had the greatest opportunities of knowing the value that illustrations have as a means of making others understand.

Therefore, endeavour to obtain the power to convey your thoughts by means of the pencil—it is a pleasant task, and one that foreigners have mastered. Why cannot our countrymen do the same, and not be beaten on their own ground, as they sometimes are, through being unable to indicate their method even by the roughest of sketches, to say nothing of their more artistic way of work?

This lack of becoming acquainted with everything connected with our business or craft as far as opportunities allow us seems to be a usual thing now, for I noticed the other day that William Morris, poet and socialist as he is, said "that there were no craftsmen now except surgeons." Such a statement as that from one who, I fear, knows only too well what he is talking about, hits, and hurts too, as Mark Twain says, "until we get level again." I hope some of my readers will help us to get level by removing some of the truth of that accusation, for it is an awful condemnation as it stands, be the fault whose it may.

HOW TO MAKE A PIANO.

BY "NIL DESPERANDUM."

POLISHING THE PIANO—THE PROCESS—FLY FINISHING.

IT is now necessary to beautify the exterior in some way. As I pointed out in the paper on "Fitting-up" that the ornamentation was decidedly a matter of taste, I think the same remark applies equally to this part. It is usual in the pianoforte trade to polish with shellac polish: this is made from shellac held in solution with methylated spirits; the lac is manufactured in several parts of India, and is produced on the branches of trees, in the form of a cellular incrustation, by an insect—the *Coccus lacca*. This incrustation is scraped off the branches by the natives, and after being washed is put into linen bags; the bags are then held before a large fire, while a native at each end twists the bag in opposite directions, and the lac exudes through the bag and drops in a trough; it is then formed into thin sheets, and afterwards broken into fragments. Polish ready made can be procured at most oil or paint shops. You begin the work by rubbing a piece of fine glass-paper over the part you intend polishing, to remove any spots of glue or foreign substance that may have adhered to it since it was cleaned up; now take some plaster of Paris, and mix into a paste with methylated spirits and a little brown umber, to make it the colour of your walnut. Rub this well over the work so that it fills up the grain of the wood, employing plenty of friction, then wipe off clean with a piece of rag; next put some raw linseed oil on a piece of wadding, and rub over the surface; do not flood it with the oil. Although the oil is necessary in the working of the polish, if too much is used it has a tendency to sweat or ooze out on the surface. Make a rubber in the following manner: take a piece of wadding and form it in the shape of a ball, with one flat side; make this in size according to the size of the work you have in hand; now put about a teaspoonful of polish on your rubber; see that it penetrates the wadding well; by pressing with the thumb it will enter the wadding better. Now put over the wadding a nice piece of soft linen rag free from holes, and twist it round, the twist occupying the hollow of the hand when using; now rub your fine glass-paper over again, and commence by going over the surface with your rubber, in all directions, up and down, then across, then forming the letter O, then the figure 8, and every way, so that you do not work your rubber too much in one direction, as this tends to make minute spots on the work, instead of being level; work on until your rubber is dry, then replenish with more polish; you will probably have to put a drop of oil on the face of your rubber—with your finger this time—so that it works free; repeat supplying your rubber with polish until the grain of the wood is quite filled up, and a smooth surface is on the work. Up to this point of the work it is called bodying up; before finishing or spiriting off, it is best to leave the work to stand a day or two; you can then proceed to finish. Instead of using polish only in your rubber, you use half polish and half spirits, and work with this until you remove some of the smears left from the bodying: this has the appearance of steam on the work; your object is to remove this. After using half and half, you make a rubber of methylated spirits only, using very lightly until you find it getting dry, then you can use more pressure, until the smear is finally removed. The fly finisher now receives the parts of the case from the polisher to put together; he has to see that all the different parts of the case are complete. I will now describe what the reader has to do at this stage: a very important and necessary work is to take a pair of bellows and blow out all small particles of dust or shavings which may have lodged behind the strings or in any other part of the piano; it is better to stand the case on its top on a clean board, and tap the bottom gently with a hammer: this makes the dust fall from under the bottom plate. Now put the trusses or brackets in their place between the key bottom and truss toes: these are secured with screws through the bottom of truss toes and top of key bottom; you then put on four castors with screws, two being on the truss toes and two on the bottom of the back. At each end of the keyboard you will find there is a vacant space: this you fill with blocks 7 in. long and the width of the spaces, to stand $\frac{1}{8}$th of an inch above the key: these are called key-blocks. Now you can hinge the fall and back flap together; see that it fits in its place nicely, and try whether it locks; if it does to your satisfaction, then put the name-board on: this is screwed to the back flap from its bottom edge. Now that the name-board is in position, you will find that it will not go down into its place by reason of the sharps or black keys being too long; you cut the ends off these after marking, so that they are $\frac{1}{8}$th of an inch clear of the front of the name-board. You may have to plane a little off the bottom edge of the name-board so that it rests on the top of the key-blocks and the back flap on the cheeks; also glue a strip of red cloth or flannel along the bottom, allowing it to stand over so that it shows behind the keys; now hinge your top together, fit panels, and fasten them in. On the pedals you put bosses: these are round pieces of brass to prevent the wood being

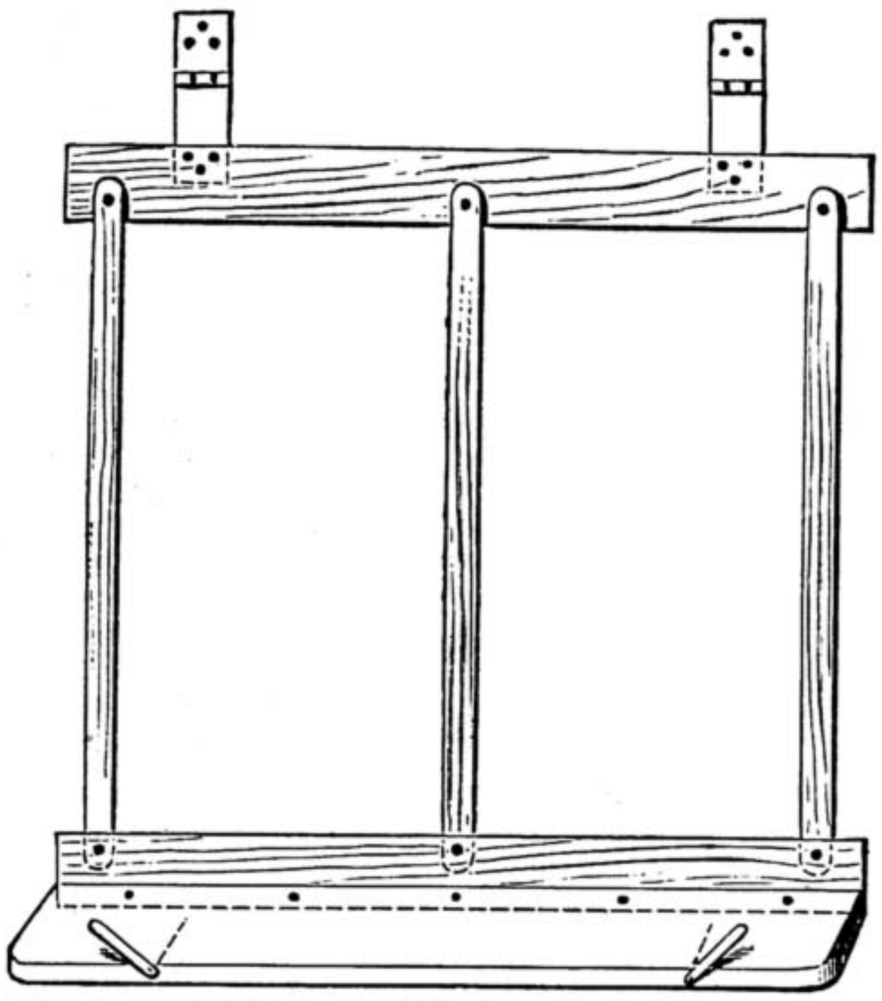

Fig. 1.—Desk to support Music. (Scale, 2 in. to 1 ft.)

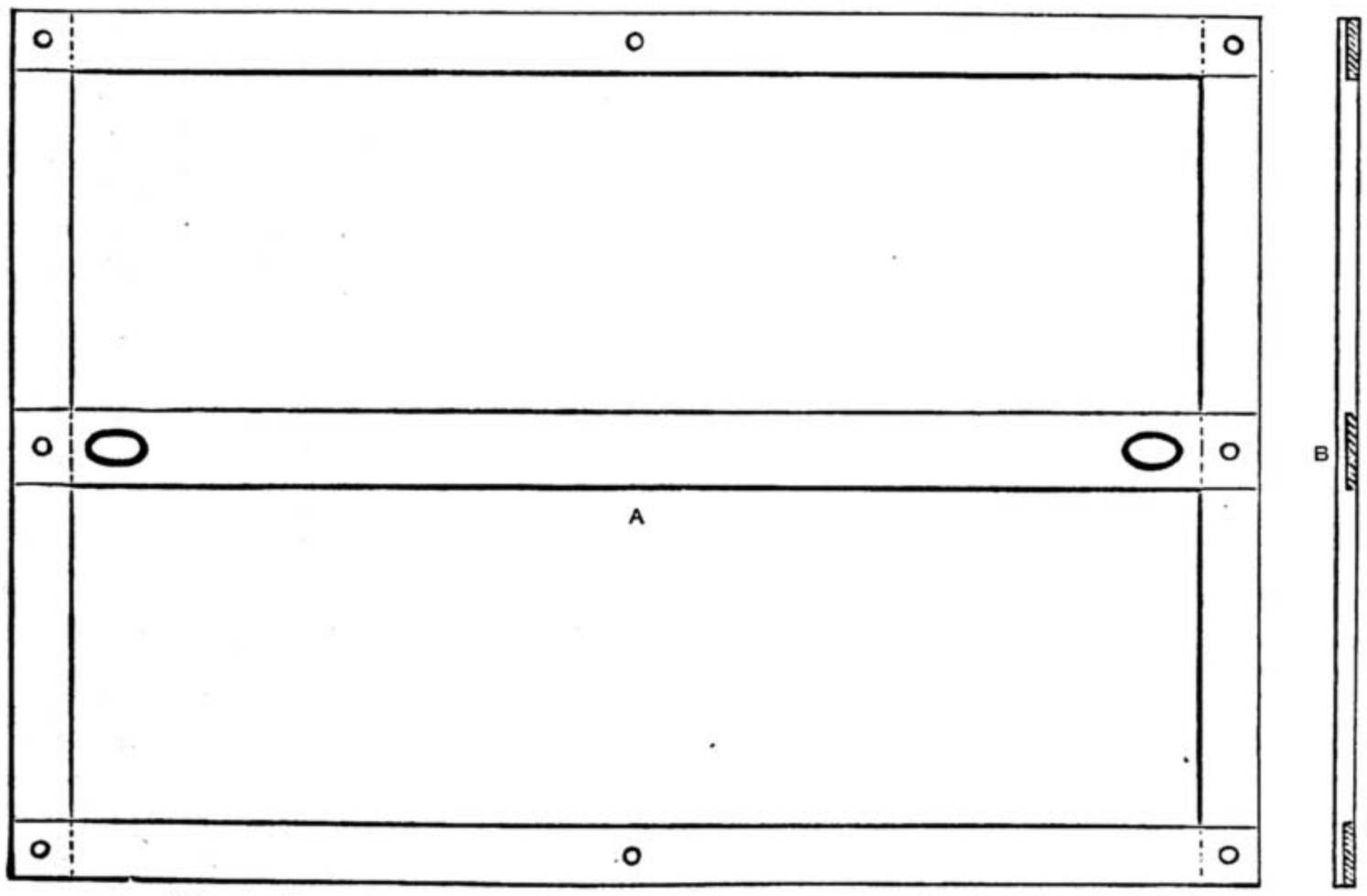

Fig. 2.—Back Frames in Plan (A) and Section (B). (Scale, 1 in. to 1 ft.)

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worn by the feet; you will now require a back frame to fit in the back of the piano to be covered with lining, or any material the reader may choose: this is merely a square frame made of ¾ in. pine, with a rail crossing its centre: this is used in lifting the piano about; you level the ends down to the frame, and clean up with-glass paper and colour it with brown umber and polish. Now screw your back frame in, and put in two round knobs just under the top at the back, to prevent it touching the wall. You will now require a music desk for your piano; the kind that will suit this piano is what is known as an overhanging desk; this is comprised of six pieces of walnut, ⅜ths of an inch in thickness, two pieces ¼ in. wide, one piece 1½ in. wide, and three pieces ½ an inch wide; when complete, it closes up, and turns over the top door out of sight; you will want six desk rivets and washers, a pair of overhanging hinges, and a pair of book-holders; the two 1½ in. pieces have three holes bored in each for the rivets to go through, and are 14½ in. long; the 1½ in. piece is the same length, and is screwed by its edge to one of the 1¼ in. pieces, while in the other edge is placed the book-holders; the three ½ in. pieces are 12 in. long, and have a hole for a rivet at each end: these three are riveted, one end to the top of the desk and the other to the bottom; the overhanging hinges are screwed on the top edge of the top door (and are let in the thickness of the hinges) at one end, and the other end to the back of the top piece of the desk. Sconces or candle holders are not always used, but if you require them, these can be screwed on the panels on the door.

MEANS, MODES, AND METHODS.

How some Broken Roman Pottery was Mended.

A few months ago, some seven or eight small Etruscan vessels and vases were put into my hands for repair. They were mostly in fragments, as their discovery was due to the partial disappearance of a ploughshare in a tomb near Soriano, over which the unsuspecting ploughman was driving his team.

I have seen similar and larger specimens in museums repaired with narrow tape cemented on the outside; this, no doubt, is strong, but it certainly is unsightly. It might do on large vessels such as amphoræ, but on small ornamental vases would be quite out of place.

To rivet Roman remains would in most cases be impossible; the outlay of time and extra care would be enormous, and the risk of further increasing the number of fractures too great.

Ordinary cement and liquid glues seemed to be absorbed into the crumbling and very porous clays too readily to make a good joint, and I was rather at a loss how to go on. Then it occurred to me to try ordinary carpenters' glue. I had some by me (it is needless to repeat here how to prepare and mix it, and how the best quality is cheapest in the end), and making it rather thin, I tried the effect. First, I moistened the edges to be joined with clean warm water, and then put on the glue rather freely with a long flexible chip of bamboo (this, by the way, is my invariable substitute for a glue brush), put the broken edges in their places, and held them there with stout indiarubber rings, crossing and recrossing them wherever required. The glue, when dry, made an excellent joint; and a little trimming up of excess glue finished the job.

To further strengthen the vases, and to make good several pieces that were missing, I mixed some fresh plaster of Paris about the consistency of thick cream, and after slightly wetting the inside of one of the vases, poured the mixture inside, and turned and twisted the vase in all directions till the plaster was quite set. In this way I had built up a new vase inside the old, and the result was and is successful to this day, as the vases so repaired stand the dusting of the ordinarily careless housemaid.

One little vase of the saucer kind had a triangular piece missing from its circumference; this I was able to build up by chucking the saucer by the foot in a Whitton chuck, moulding moist plaster into the gap, and then removing the superfluous plaster with a chisel as the saucer revolved in the lathe; in this instance, the lathe reverted for once to its original form, viz., the potter's wheel.

The friends who had entrusted their pieces and fragments to my care were so delighted, that I became the proud possessor of two vases dating from B.C. 29, and this year some more vases were brought specially from Italy for me to mend.

H. J. L. J. M.

Prevention of Air-Bubbles in Graph Composition.

Those who, like myself, prefer the hektograph or chromograph, or, in fact, any of the simple graphs or gelatine processes for reproducing letters and designs, may have often been worried by the air-bubbles which will keep rising while the liquefied composition is beginning to solidify. These bubbles can easily be removed in the early stage of the solidifying process (in fact, they only rise then) by holding a heated piece of metal such as a poker or a soldering-bit near enough to the bubble till the air therein expands and bursts the bubble. I always use a gas-blowpipe flame myself, and find it very simple, and more effective than the heated metal; care, of course, must be taken in either case to avoid scorching the composition.

H. J. L. J. M.

Two Misfortunes and their Lesson.

The other day, in mending some broken articles, I had two curious experiences. An old Sèvres cup (which I had picked up for a mere trifle at a curiosity shop in the country) got cracked. After cleaning and warming the edges, I cemented them with Le Page's Liquid Glue, wiping off the superfluous glue, as I usually do, with a damp rag. However, I had inadvertently left some on the gold with which the cup is plentifully adorned, and after some hours, in cleaning off the little hard ridge of superfluous glue which had formed under pressure, I was surprised and disgusted to find the gold come away with it in a thick flake.

At the same sitting I had mended, with the same useful cement, one of those little views which are apparently phototyped permanently on some white unglazed material. I glued it carefully, wiped off the glue that oozed through the joint, and placed the view, face downwards, on a thick piece of plate-glass to keep everything level, and to enable me to see if any additional pressure were required in any particular place. All seemed well; but next day, in removing the view from its resting-place, I found that a little glue had oozed out under pressure, and had spread about one-eighth of an inch on either side of the joint; the photo, which I had fondly fancied indelibly reproduced on the porcelain or glass, was firmly stuck on the plate-glass.

In both of these cases the acid in the cement may have caused the mishap by acting on the gold in the one case and the photographic film in the other; but the moral to be learned is certainly this: In cementing any surfaces that are not perfectly plain, remove very carefully all superfluous cement with a damp rag or sponge, so that the joint will not require cleaning off when dry.—H. J. L. J. M.

A Cheap Graph.

Take 8 oz. of glycerine, 2 oz. best glue; to the glue add 8 oz. of water, and when dissolved, stir in the glycerine, pour the mixture into a zinc dish, and as soon as it sets it is ready for use. If too much glycerine is used, the paper will stick to it; if too much glue, it will not take a good impression. The remedy for this is re-melting, and adding either glue or glycerine till it is right.—E. A. P.

The first volume of Work is now fast drawing to a close, and the hints and suggestions given here are the last that can be given in the numbers of which it is composed. I trust in time to come that much more will appear in "Means, Modes, and Methods" than heretofore, and that readers, who know a thing or two that they have found to be of use and benefit to themselves, will send a brief account of their experiences in making or mending, and recipes which have fairly stood the test of trial, for insertion in this part of our Magazine. There should be no holding back under the notion that the idea or process or wrinkle to be sent is lacking in importance or is too simple to be of value. Whatever it may be, without doubt it will be useful, some day or other, to one or another of those who read Work. The only thing I stipulate for is that the information sent shall be the result of experience and not copied from a book.—Ed.

WHEEL CUTTING AND DEPTHENING.

BY FRANCIS CAMPIN, C.E.

Having in a former article ("Toothed Gearing," page 581) shown how to draw correctly the forms of the teeth of wheels and how to proportion their dimensions, I now purpose to describe how the teeth are made, and the distances of the wheel centres properly adjusted.

Wheels of moderate and large diameters are cast to form, and subsequently have the teeth cleared out; but those of small size must be cut or stamped from blanks prepared for the purpose. Stamped wheels are chiefly made in America, for the cheap clocks supplied by that country. They are necessarily far inferior to wheels formed properly by suitable machinery, and will not here receive any further consideration. The largest spur wheels have the teeth finished in a kind of planing machine, the cutting tool having its edge accommodated to the form of tooth required, but smaller ones are finished by rotary cutters and other milling appliances. Very great advances have been made during the past ten or twelve years in the improvement of milling machines and the tools used in them, and the introduction of emery wheels in some cases in which steel rotary cutters

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were formerly employed has been attended by advantageous results.

For clearing out the teeth of cast wheels of moderate sizes, the emery wheel has been found very effective, as the occurrence of a hard spot will not be so destructive as it would prove to a cutting edge. Rotary cutters were formerly made of the best wrought iron, and after being reduced to the required shape were "case-hardened" by being buried in powdered carbonaceous material, such as charred leather, and kept at a red heat for some hours, and then hardened by cooling in water; by this process the exterior parts—to a depth of about one eighth of an inch—were converted into steel, thus giving a hard cutting edge, supported by a tough interior body of metal. The improvements in the manufacture of steel, however, have enabled us to make these tools entirely of that metal, without having any fear of their failure through want of toughness. The cutters used in the finishing of wheels must, of course, have their peripheries made in the form of an exact counterpart to that of the teeth to be produced, and of a thickness or breadth of face equal to the distance between two teeth.

A simple form of wheel-cutting machine is shown in Figs. 1 to 4; Fig. 1 is a side elevation; Fig. 2, a plan; Fig. 3, a cross section, taken vertically through the bed of the machine along the line, X X. It shows the cutter in position to act upon the blank. Fig. 4 is an enlarged front elevation of the dividing plate. Like letters indicate the same parts in all the diagrams.

The machine is supported upon two end frames or feet, A A, upon which is securely bolted the bed, B B, which is somewhat similar to that of a lathe, but made wider in the middle to carry the cutting gear. At the left-hand end of the bed is the headstock, C, securely fixed there, with the centre line of its mandrel truly in line with that of the poppet head, D, at the right-hand end of the bed, B B. On the mandrel of the headstock, C, are carried the speed pulleys, E, and the dividing plate, Q, and on its extremity is screwed a chuck, by which one end of the bar, P P, may be securely held, the other end being supported by the poppet head centre as shown.

Upon the bed, B B, is fitted a saddle, F, which is made so that it may slide truly, and without shake, upon the front part of the bed, a lip, Y, running against the inside of the bed, and a strip, W, which fits under the front V shaped edge of the bed, holding it in position and guiding it. The surfaces of the bed upon which the saddle works must be made exceedingly true, both in respect to being true planes and to lying with their edges exactly parallel to the line of centres of the machine, so that when the saddle, F, travels along the bed, B B, its motion shall be truly parallel to the centre line of the bar, P P. The strip, W, is secured to the underside of the saddle, F, by set screws, which pass through holes which will allow of a slight adjustment, so that the strip may press evenly throughout its length upon the front of the bed.

Within the projecting part of the bed (see plan, Fig. 2) there is fitted a longitudinal screw, G, which may be turned by means of the handle, G′, made to fit on to a square on the end of the screw, G. This screw, of which the longitudinal position in relation to the bed is secured by collars at each end, works in a nut attached to the underside of the saddle, F, so that by turning the handle, G′, the saddle is caused to move along the bed of the machine in either direction, as may be desired.

Upon the saddle, F, is fitted a slide, H, so as to slide upon it in a direction at right angles to the length of the bed of the machine, the rubbing surfaces in this case being as accurately prepared and adjusted as in the case of the saddle and bed. Within the saddle, F, and in the direction of its length, is fitted a screw, I, actuated by a handle, I′; this screw works in a nut attached to the underside of the slide, H, so that it can be moved along the saddle at pleasure by turning the handle, I′, which, like G′, is removable, being fitted on to a square at the end of the screw, I. Upon H is mounted a standard, K, to afford a bearing to the upper end of a vertical spindle, of which the lower is carried in a footstep on H; on this spindle are secured a rotary cutter, L, and some grooved pulleys, M. For very light work the cutter spindle may be held entirely by the bottom end, and so the standard, K, dispensed with, thus allowing clearer access to the work. N is a blank centred upon the bar, P P, and firmly secured thereon by washers, O O, screwed tightly up. Q is a dividing plate, already referred to, as fixed upon the mandrel, and R is a stout spring, fastened to the bed of the machine, and having at its upper end a pin, Z, which fits into perforations in the dividing plate. S S is a gut band carried round one of the grooved pulleys, M, to drive rotary cutter, L, and being itself driven from some running pulley placed in such a position that the action of the band will not be affected by travel of the slide and spindle. T is a hand wheel, by turning which the centre in the poppet head is advanced or retired when placing the bar, P P, between the centres. The wheel is fixed on to the end of a screw, which works in the tube carrying the centre. When the proper adjustment is made, the tube is secured by screwing down the set screw, U. The nut, V, retains the poppet head in place upon the machine bed; this has to be loosened to set the poppet head approximately when the range of the poppet head screw is not sufficient for that purpose. The dividing plate, shown in enlarged elevation at Fig. 4, has several series of holes drilled in it to allow of wheels being cut with different numbers of teeth.

The method of operating this machine must be described; and, in the first place, it is to be noticed that it can be used for turning the circumference and side of the blanks as well as cutting the teeth on the wheels. For this purpose, the slide, H, is removed and replaced by a tool holder, the same as that ordinarily employed on a lathe; this being adjusted, and the blank in position, the machine is driven like a lathe by a belt upon one of the pulleys at E; the blank being prepared, the slide, H, with its appurtenances, is replaced, the belt removed from E, and a gut band fitted to one of the pulleys, M. The circle of holes in the dividing plate suited to the number of teeth required in the proposed wheel is now selected, and into one of them is let fall the pin, Z, on the spring, R. This holds the blank in position, and by means of the screws, E and I, the rotary cutter is brought up to the work, and being set in motion a hollow between two teeth is cut, the cutter being travelled by the screw, G, completely across the edge of the blank, after being set by the screw, I, to cut to the proper depth. One space being thus cut, the cutter is withdrawn by working the screw, G, leaving the screw, I, alone, so that the cutter will be set right for depth for all the following spaces.

The pin, Z, is then pulled back, and the dividing plate—and with it the blank—turned until the hole corresponding to the next space comes under the pin, which is then allowed to fall into it, and another space is cut, the cutter being traversed through the blank by means of the screw, G, and this operation is repeated until all the teeth are formed.

In the adjustment of this machine, there are a few points which require especial attention, in addition to those already referred to. The spindle which carries the cutter must be exactly at right angles to the machine bed in all directions, and the centre of thickness of the cutter must be exactly the same height from the machine bed as are the centres upon which the bar, P P, turns; the cutter itself must, of course, run with absolute truth upon its spindle and entirely without shake; otherwise the teeth cannot be made of the proper form.

When it is only occasionally that wheels are required to be cut, as in amateur work, an attachment may be made to fit on to the slide rest of an ordinary lathe, being in form as shown at Fig. 5. Let A A be the top of the saddle across the lathe bed, which latter is shown in section, B being the handle of the cross-traversing screw; C and C′ represent the two parts of the slide upon the saddle arranged for angular movement, D being the handle of the screw for working the top slide, E. The tool clamps are supposed to be removed from the top slide, and the frame, F, secured to it in their place; this frame is made with bearings, G G, in front, in which is carried a vertical spindle, having at its lower extremity the rotary cutter, H, and at its upper the grooved pulley, I, over which runs a gut band, K, driven from some convenient running pulley.

When the wheels are very small, such as clock wheels, they will not be mounted between the centres on an arbor, as shown in Figs. 1 and 2; but put upon a short arbor fixed in the mandrel of the headstock, and secured thereon by a nut.

In cases where teeth are cleared out by a single cutting tool acting in a straight line, the tool as it descends must be guided by a template of the same form as the side of the tooth when finished.

Worm wheels may be cut in the lathe by first roughing out with a rotary cutter placed at the proper angle, and subsequently finishing the teeth off with a "hob," which is a fac-simile of the worm or tangent screw with which the wheel is intended to work, but which is made of steel, and hardened after having notches cut in its threads to form cutting edges by which the spaces between the teeth of the worm wheel are cleared out. The "hob" must be set to work at right angles to the axis of the worm wheel.

There are a few special wheel-cutting machines made by machine tool makers, and there are also some special machines of this class used by watch and clock makers; but for general use, the apparatus here described should be sufficient, with such modifications or additions as may make their desirability self-apparent for particular cases.

I now come to the adjustment of the wheels in gear, after the teeth have been properly formed, in regard to the distance apart of their centres. The importance of this depends upon the form of the teeth, for if they are involute, the distance of the

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centres need not be accurately defined; so long as they are close enough to prevent rattle, the teeth will work together accurately; but with epicycloidal teeth, the case is very different; here the face of one tooth works in contact with the flank of another—that is, the epicycloidal curve of one tooth is in contact with the hypocycloidal curve of another, and the curve of each tooth changes from epicycloidal to hypocycloidal at the pitch circle of the wheel; in order, then, that the teeth may work properly together, it is obviously imperative that their pitch circles should be just in contact; if not, the teeth will be set either too deep in gear or not deep enough.

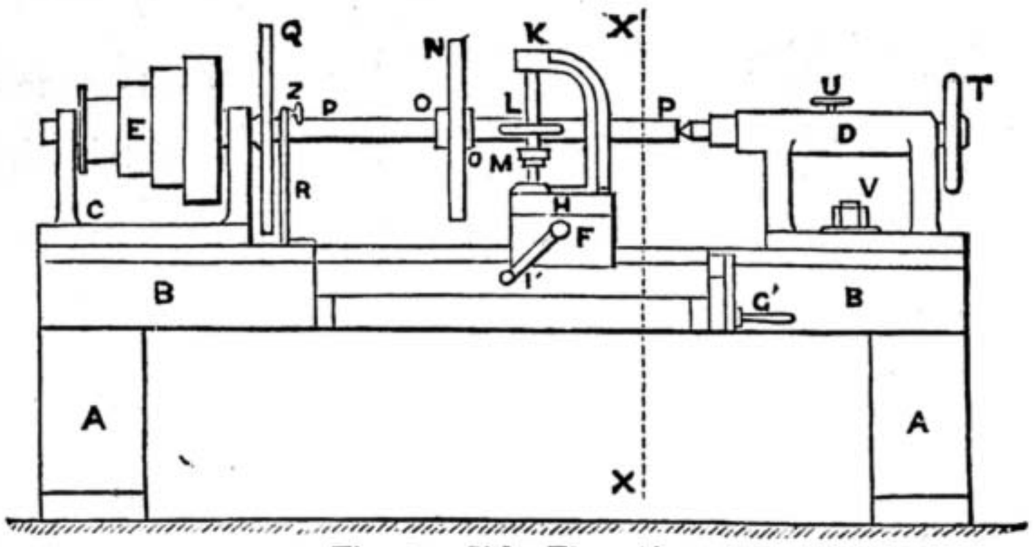

Fig. 1.—Side Elevation.

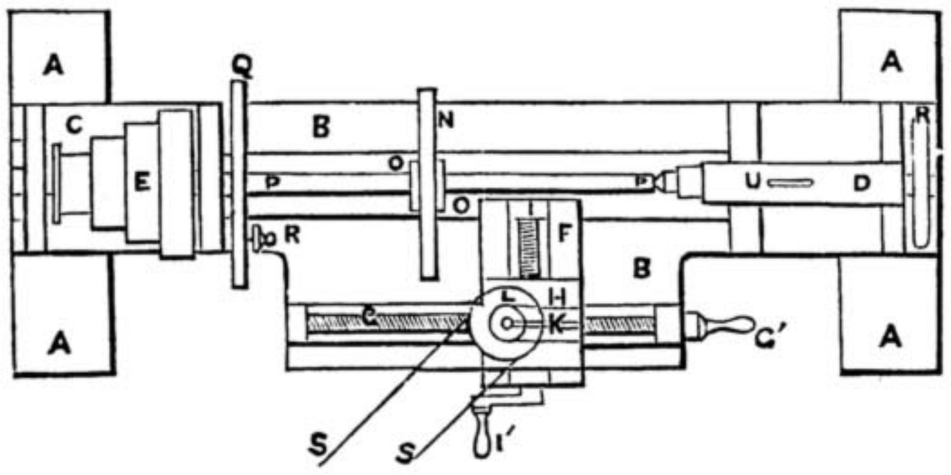

Fig. 2.—Plan.

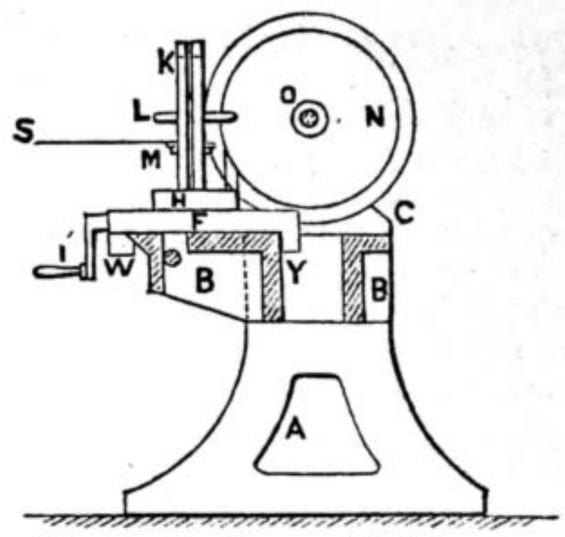

Fig. 3.—Section on X X (Fig. 1).

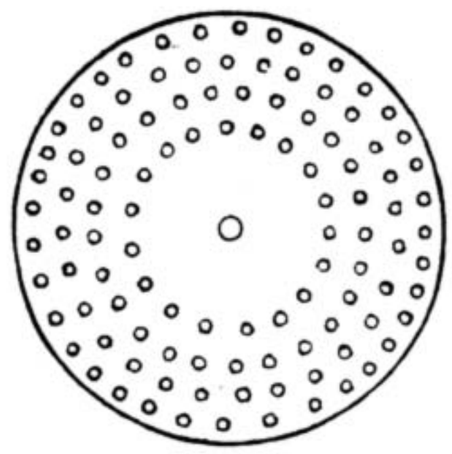

Fig. 4.—Dividing Plate.

In ordinary machinery, the sizes are such that the errors of measurement are insignificant in proportion, and the wheel centres can be marked out with practical exactitude, and the shafts upon which they are carried are also of such dimensions as to entail no necessarily perceptible error in their construction; but in the finer mechanical apparatus, such as clocks, watches, and certain mathematical and physical apparatus, the details themselves are so diminutive that a very slight actual error becomes proportionately a very serious one; therefore it is customary to determine the depth to which the teeth shall gear in such delicate machines by the sense of touch, and the centre distances are fixed by means of an instrument called a "depthening" tool. Its form is shown in Fig. 6. It consists essentially of two frames of the form shown by A A′; these frames are hinged together at the bottom, so that they can open out like a double vice. At the upper end each frame has two heads, C, C′, in which are secured centres, B B and B′ B′, by the set screws, D D′. These centres are so adjusted that they are exactly in line with each other, and the two sets parallel to each other. The inside ends are formed to support in a countersink the arbors of the wheels to be adjusted; and the outside ends are sharp points for marking off the centres, when their distance is determined, upon the plates of the machine for which the wheels are intended. The tool having been opened, the two wheels are adjusted between the centres, and the frames gradually brought together until, on turning the wheels with the fingers, they work perfectly smoothly and easily together; the sense of touch is sufficiently delicate, after some practice, to detect any roughness of action, and then the tool is adjusted until the working is satisfactory, or the operator is satisfied that the wheels do not fit, and must, therefore, be changed for others. A satisfactory result having been reached, the tool is clamped, and the centres for the wheel arbors marked off by the outer ends of the centres. The tool may be held in the table vice while in use, and the wheels are to be removed by releasing the back points before marking the centres—called pitching the wheels—on one of the parallel frames by which the wheel work is intended to be carried.

The wheel centres having been marked upon one of the parallel plates, the holes are to be drilled to receive the ends of the arbors, and from these holes the centres are to be marked upon the companion parallel plate. It is obviously indispensable that the wheels should revolve in planes parallel to the plates, and to this end it is necessary that their axles be at right angles to the same. To ensure this, the second plate is pitched from the first by means of an "uprighting tool," shown in Fig. 7, held in the vice; E, A, etc., refer to a front, and E′, A′, etc., to a side elevation of the tool, the letters themselves indicating the same parts in both views.

The upper part, A, is an accurately bored tube, terminating in a stirrup, B B, to the bottom of which is attached a disc, C, having its upper surface perfectly true, and depending from its centre is another bored tube, D, similar to A, and in exact line with it; the centre line passing through the two tubes is at right angles to the upper surface of the disc, C. In the tubes, A and D, are fitted centres, E and F.

The pillars by which the parallel plates are held together, and which also determine their distance apart, having been truly turned, the frame is put together and laid upon the disc, C, with the pitched plate upwards, the centre, F, being, of course, drawn back into the tube, F, to commence with. The centres, E and F, are made to fit the tubes accurately, and their points are truly turned and exactly opposite each other. The frame is now moved until one of the holes is brought under the top centre, E, and there secured by pressing the point of the centre into it, while a corresponding hole is marked on the under plate by the lower centre, F, which is pushed up for that purpose; it must follow then that an arbor working in holes drilled to these marks will be exactly at right angles to the side plates of the frame. In a similar way a mark is made on the under plate corresponding to each hole in the upper one, and to these marks the holes are drilled at right angles to the plate.

Some time since a correspondent asked for instruction in wheel cutting, etc. The subject, which could not be conveniently treated in "Shop," has therefore been taken up and sufficiently explained in this paper.

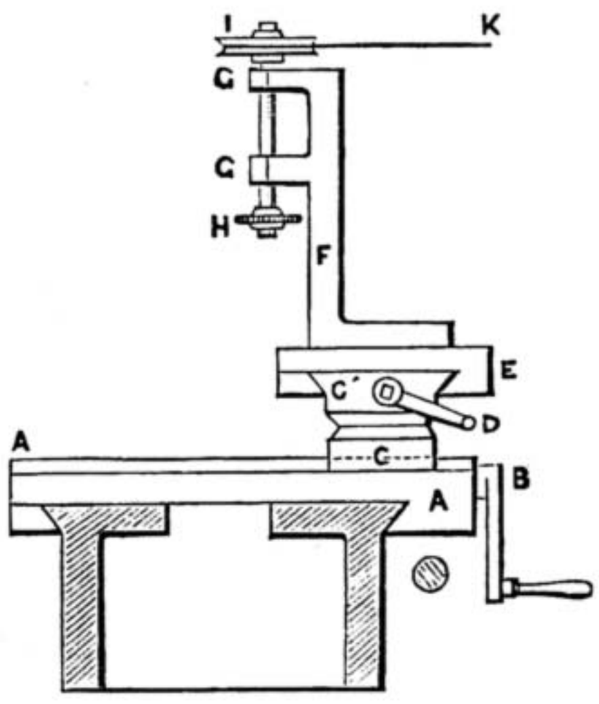

Fig. 5.—Lathe Attachment.

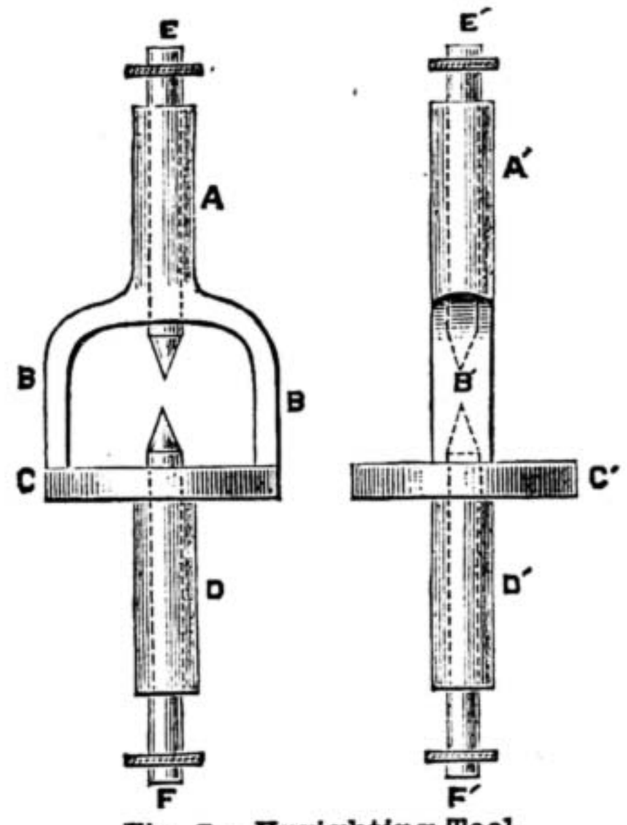

Fig. 7.—Uprighting Tool.

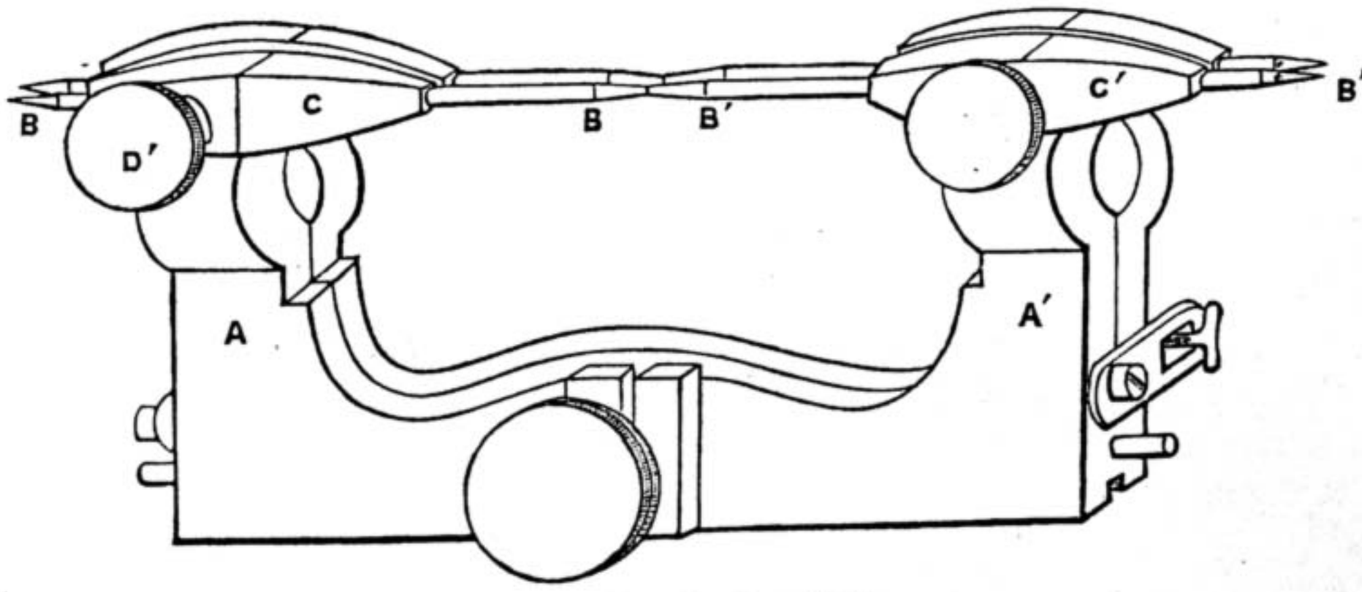

Fig. 6.—Depthening Tool.

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Fig. 1.

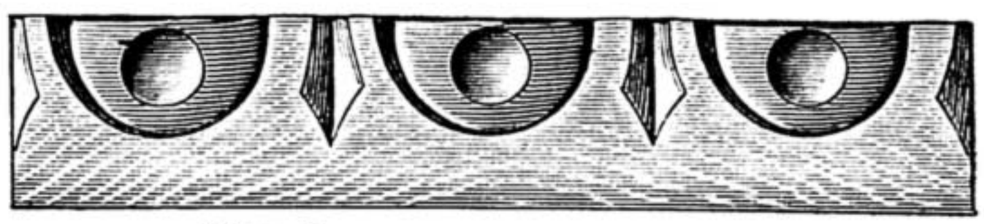

Fig. 2

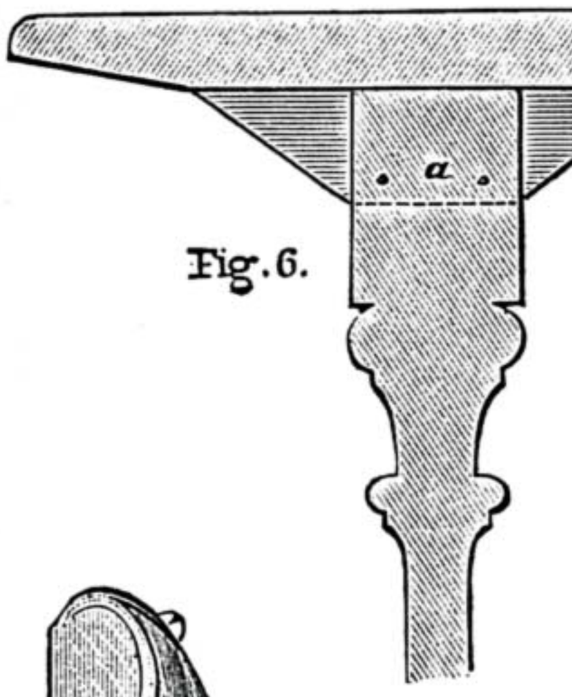

Fig. 6.

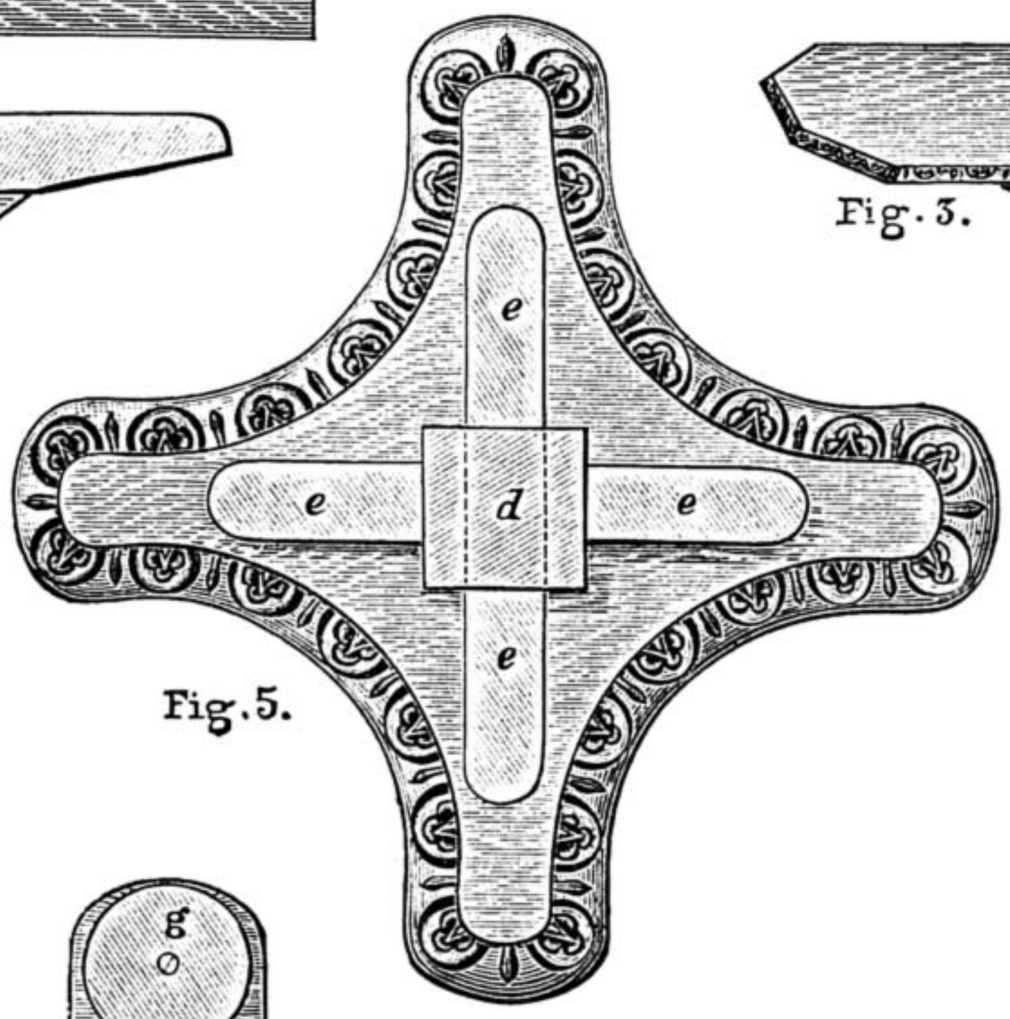

Fig. 5.

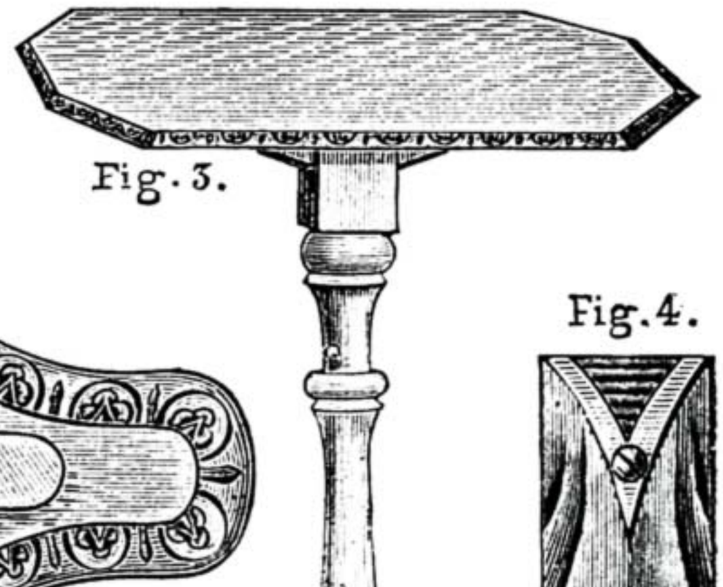

Fig. 3.

Fig. 4.

Fig. 8.

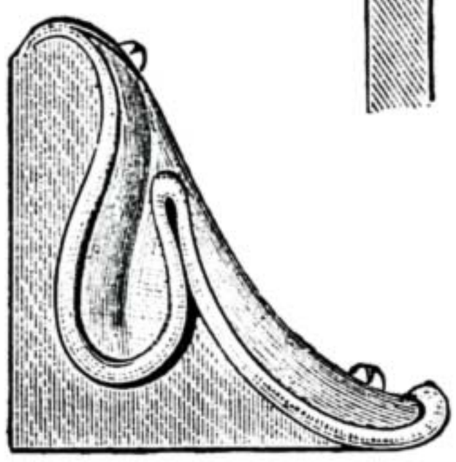

Fig. 7.

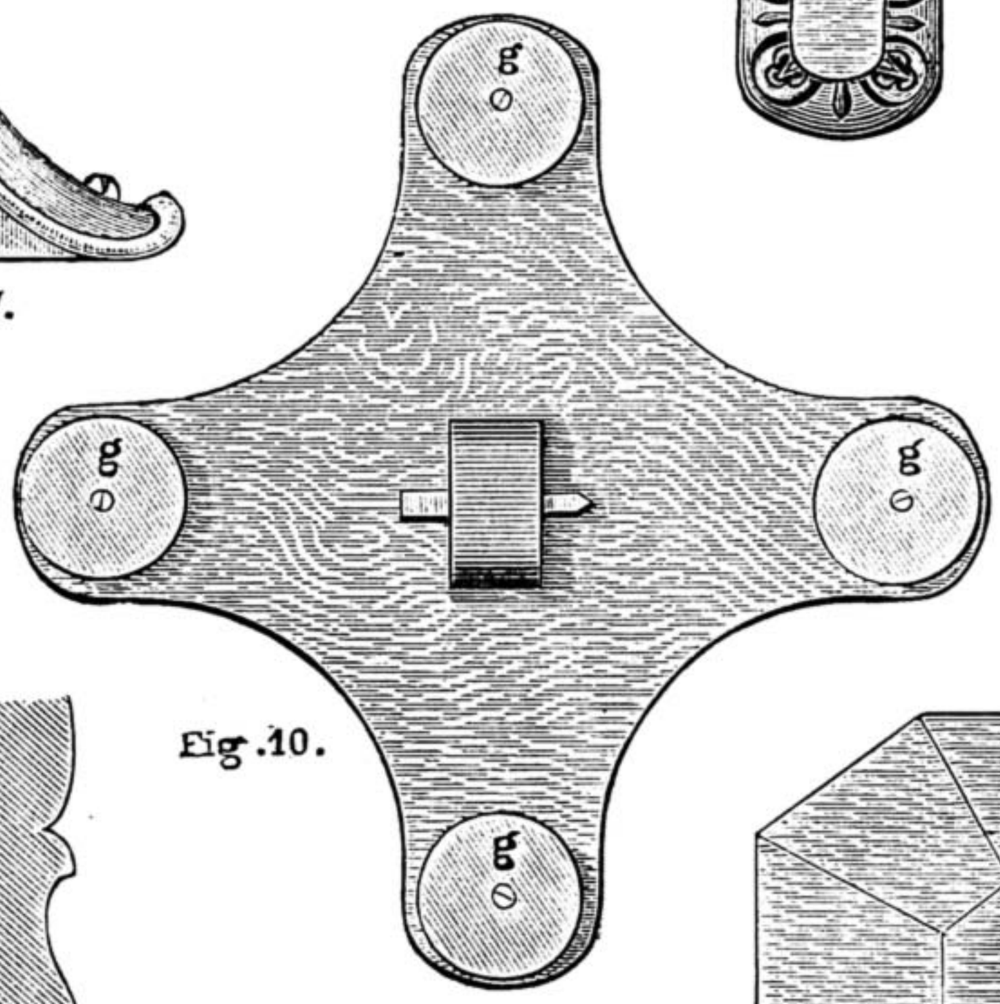

Fig. 10.

Fig. 11.

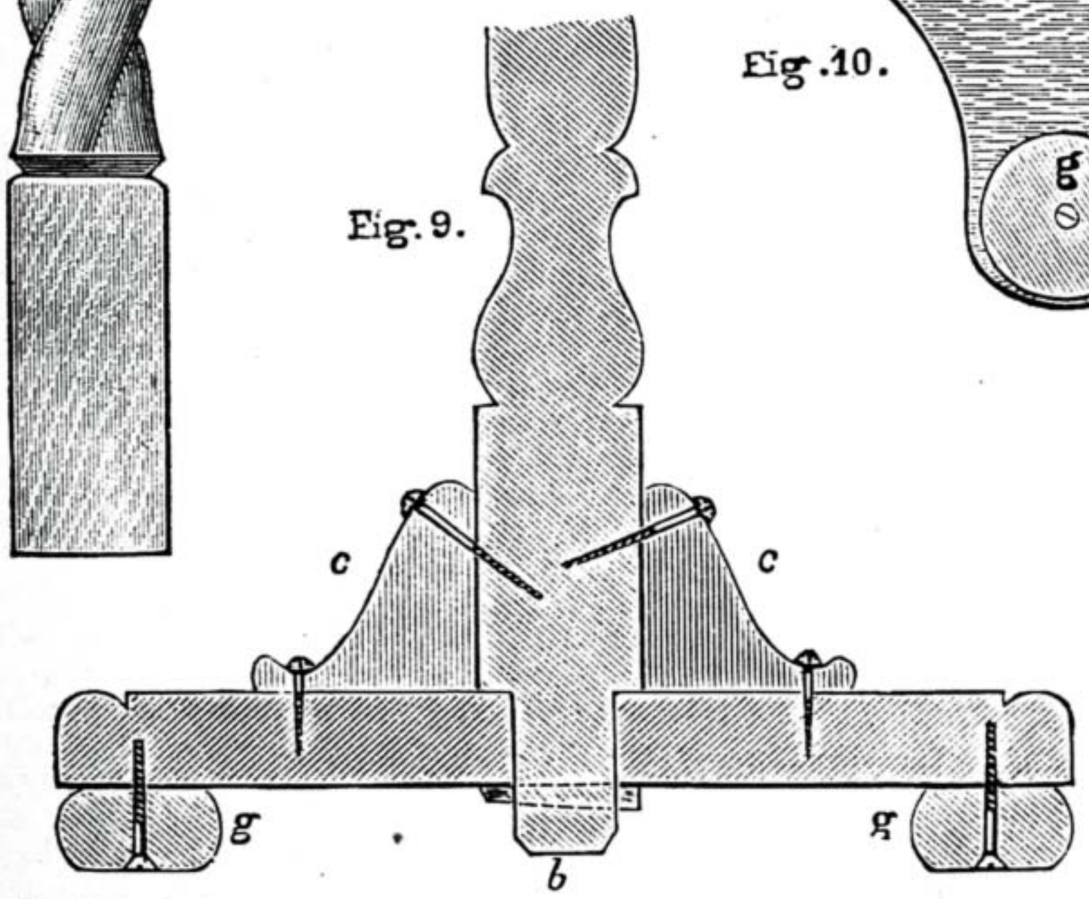

Fig. 9.

Fig. 1.—Carved Edge of Foot-Piece. Fig. 2.—Carved Edge of Top. Fig. 3.—Stand-Table: perspective view. Fig. 4.—Base-Stay: front. Fig. 5.—Foot-Piece: upper side. Fig. 6.—Section of Top. Fig. 7.—Base-Stay: side. Fig. 8.—Twist for Alternative Shaft for Table. Fig. 9.—Section of Bottom. Fig. 10.—Foot-Piece: lower side. Fig. 11.—Top of Table: under side.

A SMALL STAND-TABLE IN CARVED OAK.

BY HIRAM PRICE.

THIS small piece of furniture, of which a sketch in perspective is given in Fig. 3, will be found a handy as well as an ornamental article, and with the working drawings and practical directions about to be offered no one who can carve a little in wood will find any serious difficulty in making it. The only difficulty likely to present itself is with regard to the pillar. That shown is turned, and there are many who can handle carving tools who cannot turn; but, to meet this difficulty, an alternative design will be given, by which the pillar can be worked without having recourse to the lathe.

The dimensions of this table are exceedingly modest ones, since it is intended for no heavier duty than that of standing beside an easy chair to hold a book occasionally, a coffee cup, or any similarly unimportant matter. It barely stands 25 in. high, and its top measures 12 in. by 10 in. only. The perspective drawing of it (Fig. 3) is not to scale; all the remaining diagrams explaining it are on ¼ scale, except where otherwise specified.

Whether we use the turned shaft which appears in Fig. 3, or the alternative one

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shown in Fig. 8, the general dimensions of the pillar remain the same, excepting only that the turned work occupies more of the length by 2½ in. than the twist.

The length of the pillar from top-piece to foot-piece is 22 in., to which is to be added the tenon, passing through foot-piece, 1¾ in., making 23¾ in. in all: its base and top are 1¾ in. square. The section of top (Fig. 6) shows at *a* how the two pieces of ½ in. wood which serve to support the table-top are secured to the upper part of the pillar by screws.

At the base of the pillar the tenon *b* (see section of bottom, Fig. 9) passes through the foot-piece, and is secured by a peg; the hole through which this peg passes must be bored so high that, on tightening it, the shoulder of the tenon will be drawn thoroughly home. This, with glue, will make a joining as strong, solid, and immovable as it is possible to make: so that the four base-stays (*c*, *c*, Fig. 9) are rather added for effect than for the increased strength which they nevertheless give. Fig. 7 shows a side view of one of these base-stays, and Fig. 4 a front view as seen from above. The better to explain the carving upon them these stays are drawn to half size. They are cut from inch board, which will be better if somewhat gnarled in grain, as English oak often is, that there may be no danger of splitting. The various diagrams show how each is fixed by two round-headed brass screws, which are made to form a decorative feature.

The foot-piece, the upper side of which is shown in Fig. 5, and the under side in Fig. 10, is also of inch board, and will, like the last-named pieces, be best made of cross-grained stuff. It will be seen that though 12 in. across, this can be cut from a somewhat less than 10 in. board. In Fig. 5, *d* shows the square space on which the base of the pillar rests, whilst *e*, *e*, *e*, *e*, mark the positions of the four base-stays. The carved ornament running round the edge of this foot-piece is shown at full size in Fig. 1. The small hollows indicated as at *f*, *f*, in this figure, are each taken out with a single scoop of the gouge, and will give a crisper and better effect to the border if left sharp from the tool than if sand-papered down. In Fig. 10, *g*, *g*, *g*, *g*, indicate the places of the four balls on which the table stands: the same letter also marks these balls in the section, Fig. 9. They are an inch high, and two wide. If they cannot conveniently be turned, they can readily be worked, as octagons, by hand, from inch board. Each of these balls is, as shown, fixed in its place by a stout screw, the head of which will need to be well countersunk.

To give any separate diagram of the two pieces of board, screwed to the upper part of the pillar, and supporting the top, can scarcely be necessary. They are sufficiently explained at *a*, Fig. 6, and at *h*, *h*, Fig. 11. They are of ½ in. oak, and their outer edges along their three lower sides are bevelled off: the screws which fasten them to the top are indicated.

The top is of ¾ in. stuff 12 in. by 10 in., and the corners are taken off as seen in Fig. 11, which shows its under side. At the edges it is planed down to ½ an inch on its lower side, as appears in the section Fig. 6, which shows its narrower dimension. In Fig. 11, *h* and *h* indicate the places of the two supports mentioned above, which, it will be observed, cross the grain of the top. The screws which fix it to these supports are driven upwards, that they may not show on the upper surface. A little very simple ornament running round its edge is shown at full size in Fig. 2. This ornament, it will be found on trial, is by no means difficult to carve, and presents a highly effective appearance when finished.

Provided the person making this stand-table can turn, or can procure a turned pillar, he cannot perhaps have a shaft of form better suited to his purpose than that shown in Fig. 3. But if not, something will be needed in its place which can be made without the lathe, and as an alternative the twisted shaft, Fig. 8, is offered. A twist always looks well in oak work. In our old English (17th century) furniture it is a frequent feature, and is as artistic in effect as its successors, the screws in 19th century furniture, are the reverse. In the work of the earlier half of the 17th century we meet with single twists which frequently taper upwards, but in things made a little later than 1650 the double twist more abounds; that in the illustration is sketched from an example of (apparently) the time of Charles II.

A twist such as this may at the first glance appear a difficult thing to set about. Such, however, is not the case: it can in reality be laid out with the greatest ease and simplicity.

From a square it is no difficult matter to reduce the shaft to an octagon, and were the twist a large one, it might be well to reduce this still further, and bring it to a sixteen-sided figure; but for our present dimensions the octagon will suffice We may set out the twist upon this, and for so doing we shall need two strips of paper, each of the intended width of one fillet of the twist from hollow to hollow, and these we wind spirally round the octagonal shaft from bottom to top, giving them the desired inclination. And with regard to this inclination it should be observed that it is a mistake to attempt to get the appearance of a tight twist. The work to look well should look as if slackly twisted—that is to say, the spiral should incline to the vertical rather than to the horizontal. When we begin to wind the strips of paper they will seem to fall quite naturally, and without any trouble on our part, into their right places, and we can fix them in a temporary way with three or four drawing-pins or tacks.

One of the strips we can now remove, and having divided it in half lengthwise, we *paste* one half back where it was before, then we treat the other strip in the same manner. We now have two spirals in paper running up our shaft, and between them two bare spaces of the same width—the paper will represent the two fillets of the double twist and the bare spaces the hollows between them. This simple little operation takes some time in description, but in the actual work it is very easily and quickly done.

The twist being thus ready for working, we have to cut away the wood in the bare places, which are to be the hollows, with the gouge, to the necessary depth; making a slot with the saw up the middle of the hollow is a help to doing this, and when the hollows are worked out, we can trim off the edges of the fillets with the chisel. In finishing the hollows the half-round file is useful, and the fillets need file and sand-paper. Making a twist is a thing that any one can do if he only knows how to set about it.

In the pillar before us, as given in Fig. 8, the square base and top are left somewhat longer than in the pillar with turned shaft. This is to prevent too great a length of twist tiring the eye by its monotony. One never sees long unbroken twists in old work.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

126.—TALBOT AND EAMER'S "DIAMOND" DETECTIVE OR HAND CAMERA.

AMONG the many cameras of all kinds that are now offered to the notice of all photographers, professional and amateur, the "Diamond" Detective or Hand Camera, figured in the accompanying illustration, appears to be one that is in every way well suited for the purpose for which it is intended. It is claimed for this camera that it is "the smallest, lightest, and cheapest efficient hand camera yet introduced," and yet is capable of taking twelve pictures, 3⅛ in. by 2⅜ in., on ordinary dry plates without recharging. The size of the little instrument itself is 6 in. by 3½ in. by 3 in. It is fitted with a rapid rectilinear lens always in focus, a finder, and a shutter for time or instantaneous pictures. It is said to be entirely new in principle, form, and construction, and is thus possessed of advantages and special features

Talbot and Eamer's "Diamond" Detective or Hand Camera.

which render it particularly desirable for all who are desirous of obtaining permanent records of subjects of all kinds at a minimum of cost and trouble. In taking a picture nothing else but the camera is required, all other appliances, such as tripod, focussing cloth, etc., being entirely dispensed with, which renders it, indeed, the least burdensome of cameras to those who use it, and this will be readily understood when it is said that the instrument, which is excellently well made and most convenient in form and arrangement, weighs very little over 1½ lbs., and is supplied complete in case and with one dozen extra rapid dry plates for 30s., additional dry plates being bought at 1s. per dozen or 6s. per half gross, carriage paid. The pictures taken are of course smaller than the ordinary carte de visite, but mount nicely on the carte de visite card. They are both sharp and crisp, and will be found to be especially suitable for lantern slides, and lend themselves readily to enlargement. The camera is always ready for use until the dozen plates with which it is stored are used, and a fresh lot required. As will be seen from the illustration, the camera itself is in the form of a box, having the lens and instantaneous shutter in the front, and the dry plates, twelve in number, at the back. By an ingenious arrangement each plate when a picture has been taken is raised from its position in front into the leather pocket at top, and is then, by the finger and thumb, raised clear of the camera, and brought to the rear of the other plates. Thus each plate is brought in turn to the front for exposure, and then transferred behind the rest. The last plate cannot be lifted out of the camera, and thus shows that the entire number has been used. It is made and sold by Messrs. Talbot and Eamer, Photographic Apparatus Makers, Blackburn. THE EDITOR.

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SHOP:

A Corner for Those who Want to Talk It.

NOTICE TO CORRESPONDENTS.

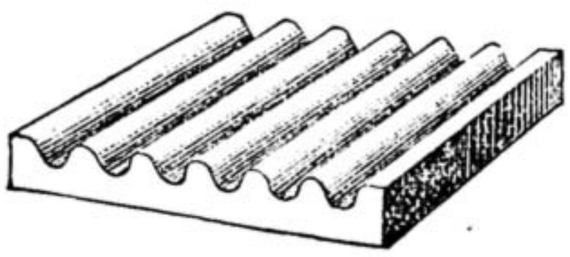
*** *In consequence of the great pressure upon the "Shop" columns of* Work, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of Work *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Electric Time Alarum.—C. H. M. (*Wylam-on-Tyne*) writes:—"I have recently received the December number of Work, and have read the article by G. E. Bonney on an electric time alarum. Some dozen years ago I constructed an alarum which, as it differed from the one described, and had some good points of its own, I daresay, if you think fit to publish it, may interest some of your readers. My object in designing the following arrangement was to make an alarum which did not require setting, or switching off, or setting on daily, because one is quite as liable to forget to attend to the alarum before going to bed as to go to sleep again after being called up. My alarum, therefore, I made so as to ring every weekday morning, but to be silent on the Sunday, and experience of years has shown that it always answers its purpose. The proper bell to use is the kind known as 'continuous ringing'—that is, when a momentary current is passed to the bell it starts ringing till stopped by pulling a cord. This current should only be sent to the bell for a very short time, say not more than for a quarter of a minute, as you cannot stop the bell till the current from the clock ceases. This makes it necessary to depend on the minute hand of the clock for completing the circuit, as the hour hand alone would remain too long in contact. This, however, is not an objection, as it makes the connections to the clock much simpler, and such as can be made without pulling the clock to pieces. The arrangement is this: a little wheel about $\frac{1}{8}$ in. diameter is placed in the path of the hour hand, and is made with 14 teeth, because in a week the hour hand passes any particular hour 14 times. This little wheel is a pin wheel with the 14 pins standing out on one face. The pins are alternately conductors and non-conductors of electricity except where the Sunday morning one comes in. It is also a non-conductor. The hour hand in passing this little wheel acts as a 'wiper,' and carries the wheel on one pin or tooth. If the tooth is a metal one the current can pass to the hour hand while the contact lasts, but when the tooth or pin is of ivory no current passes. The contact lasts about a quarter of an hour, but the circuit is not completed till the minute hand touches a fine wire placed so as to lightly touch the tip of the hand. One advantage of this mode of passing the current is that no sparking takes place at the hour hand, because the 'make' and break take place long before and after the current passes. and the only sparking is at the point of the minute hand, and this does no harm, because the minute hand passes over this connection 168 times a week, out of which only 6 times will be when the current is passing, so that the 162 times when there are no currents are devoted to rubbing the 'contacts' clean. The alteration to the clock is very simple. Pass two insulated wires in from the back, and bring one out just above twelve o'clock, and the other out just below six o'clock. The top wire should terminate in a bare end of very fine wire (36 B. W. G.) like a hair, which may be made to stand up in the way of the point of the minute hand. This wire being so fine offers an insignificant resistance to the path of the minute hand, which merely sweeps over it on each passage. The bottom wire must be connected to the little pin wheel, which is made as follows:—Take a piece of latten brass and cut out a piece the shape of the letter Q, making the circle about $\frac{5}{8}$ in. diameter. In the centre rivet a portion of a toilet pin, leaving it standing out about $\frac{1}{16}$ in. This forms the base plate and the centre pin on which the little wheel is to revolve. Next take a piece of ivory $\frac{1}{16}$ in. thick and $\frac{5}{8}$ in. diameter, and another piece of the latten brass. Lay these together, and drill 14 holes through them near the outside edge, and one hole at the centre. Put 6 points of toilet pins through the ivory, and rivet them over in the brass. This will hold the two well together, and being spaced in alternate holes they will go nearly round the wheel. Then file up 8 little ivory pins for the rest of the holes, and fasten them in with shellac. Level all off till they stand about $\frac{1}{32}$ in. out from the ivory face. The wheel being finished place it on its pin, which stands in the middle of the base plate made in the shape of the letter Q. Spin it round and see that it runs true and very freely. Now we want to introduce a little friction to make the wheel stay where it is placed, but to give little or no work to the hour hand to move it. This is best done by a small washer of felt, say, $\frac{1}{16}$ in. diameter, which place over the centre pin together with a similar one of the latten brass, and rivet the centre pin to keep all in place. The wheel being now complete, attach the bottom wire to the tail of the Q, and fix the Q base plate to the clock face with thick shellac varnish. Being so small it does not look unsightly, any more than does the addition of a seconds hand to a clock face. It will be seen now that when the hour hand touches lightly against one of the metal pins of the little wheel the current can pass through the wire which we attached to the tail of the Q because the metal back of the wheel is touching on to the Q base plate, but that the ivory front of the wheel and the ivory pins prevent any current from passing at any other time. This arrangement is of course only for passing the current at one particular time, namely, 6 o'clock, but in most cases it is all that is required. I don't mean that 6 o'clock will do for everybody, but that one fixed hour will do in nearly all cases, and the clock can be fitted accordingly for 5, 5.30, or any time that may be required. In the few cases that I found it necessary to get up extra early or late I put the clock on fast or back slow the night before. If any one wants the arrangement made so as to be able to vary it to any extent, the little pin wheel instead of being made a fixture could be made to attach to any hour or half hour position, and the wire which is to be touched by the minute hand could be brought out at each quarter hour, and being so small would never be noticed. However, I write more for cases like my own, where the getting-up time is the same all the year round, and hope that others may find the advantage of having a bell which will ring every workday morning at their usual time of rising, and will continue to ring till they get out and pull the string to stop it, but which will leave them to sweet sleep on the Sabbath, and all without having to arrange it overnight."

P. K. P. Glass.—E. P. (*Great Yarmouth*) writes:—"Please to explain what P. K. P. glass is, as the tradesmen in this town do not know what it



Fluted Glass.

is. A. G. (*Newcastle-on-Tyne*) speaks of it (see page 619) under the heading 'Rubbing down Oilstones.' Will A. G. say if he means fluted glass?"

Book Repairing.—W. J. C. (*Birmingham*) writes:—"I learnt bookbinding from papers in a periodical. I find it most useful in repairing. I always put on a strip of smooth brown paper over the muslin. It is almost necessary to have a handy press to keep the back tight while cleaning off glue, gluing up, etc. Mine is made thus:—Two pieces of ash 3 by 3 in., about 20 in. long, are bolted through near the ends by about 12 in. bedscrews; these will hold the book well compressed. This press is more convenient if mounted in a box—say, 20 in. long inside—resting on a piece of wood at each end, so that the top of bars is level with top of box; the bedscrews will come through the front edge of box with nuts outside working against washers or plates. The box and press should be big and deep enough to drop into it, say, a volume of Work or Quiver—20 in. long by 10 in. deep, any breadth. If the loose back of the book is broken through at the hinges, it may be repaired by some fabric of similar colour inside; or, still better, fasten the two lids on as directed (see page 588), and then put on a loose back as below, covering the back and 1 in. each side with dark buckram, a very strong material, gluing the old back outside, or cover with white ticket buckram, which is not so strong, but one can write a title on it. To make the ordinary loose back which falls away when the book is opened, screw the book (with lids) back upwards in the press. Cut a piece of thin card or cartridge paper or thick note paper just to cover the back between the lids, roll this round a round ruler, so as to give it the proper curvature, then place it on the back, securing it to the lids by a bit of thin paper pasted on overlapping the lids; then cover the back with buckram, or leather, etc. Lepage's Fish Glue is a very convenient thing for the book repairer. The following paste is always ready:—Best flour, 2 oz.; water, $\frac{3}{4}$ pint; salicylic acid, 16 grains; alum, 32 grains. Break down the flour with some of the water with a paste brush, and add the rest of the water; heat it till it no longer thickens, stirring constantly; lastly, add the alum and acid, and put it into small pots—say, $\frac{1}{4}$ lb.—and tie over. I am not in love with Mr. Bonney Steyne's plan of sewing through buckram (Work No 6), but I have tried a modification of it with success—viz., cover the back of the pamphlets or sheets with a piece of white buckram overlapping 1 in. on each side; screw up the back so covered in the press, and then make four or six sew holes through the buckram and sheets; then the sheets or pamphlets can be sewn quickly and easily, making a strong book which opens very flat. I thank Mr. Bonney Steyne for some happy suggestions. I have just bound Cassell's 'Cathedrals' in Japanese gold paper with old gold Roman satin for the back.—N.B. In using Roman satin, glue the boards, not the satin."

II.—Questions Answered by Editor and Staff.

Gilding Methods.—J. S. L. (*Long Eaton*).—Several answers have recently appeared in "Shop" concerning gilding, and these you have doubtless carefully perused, as bearing upon your query. To gild with gold-leaf oak mounts and fillets, such articles being of an absorbent nature, requires some preparation. By frames in the white, I take it that you mean wooden frames, and not compo-faced ones, in which case this description will suit for all three. Stop the suction of the wood surface to be gilded either by rubbing in French polish, or by two coats of white, or brown-hard, spirit varnish. The former gives the best surface, and the smoother this is the more burnish the gold will have. Finely glass-paper down, if necessary, then apply a very bare but regular and evenly distributed coat of gilders' oil gold size. This must now stand aside out of dust until the next day, when it is dry, yet not so hard but that the wondrously thin gold leaf will stick to it. The process and object of the gold-sizing is this: to spread as thin as possible a film over the object, so that its presence is only known and justified by its holding the gold leaf. You will thus see that neither the polish or gilding should in the least prevent the grain of the mount from appearing. The manipulation of the gold leaf, if you are not used to it, will give you the most trouble. Gold leaf is sold in books of twenty-five leaves, each about 3¼ in. square; the ordinary, known as extra deep, which chiefly refers to its tone or colour, lies between paper leaves, dusted with rouge of some sort. Transfer gold is the same, but upon each leaf of gold a piece of white tissue paper is superimposed, so that the latter—the book having been subjected to pressure—when drawn out, has the gold affixed thereto. To use the first kind you require much practice, and gilder's tip, cushion, and knife, etc. The transfer, however, costing about 1s. 6d. per book, you may manage. Draw out a leaf of the tissue, and lay upon the mount, press evenly but gently with cotton wool, and it will affix itself to the size. When all is gilded gently rub with the wadding, and remove gold dust. Finish with a weak coat, and spread quickly but evenly, of clear size or with isinglass, one pennyworth thoroughly dissolved in one gill of hot water, used when cool or just warm. Prominent portions of a frame, etc., can be easily, if previously carefully gold sized, gilded by transfer, but hollows, etc., you can see would be rather awkward to get at. If you have compo frames, prepare them with paint or enamel, anything to make the surface regular and non-absorbent, then gold size and gild. The process of gilding will, in the house-decorating papers, be fully dwelt on. Space will not permit of more here. Many thanks for your letter and your pithy remarks. Let me assure you that the Editor of Work and his staff are both enthusiastic and practically minded as to the position of this paper in contemporary literature, and that the former is determined to justify, by its lasting success, his address to all workers contained in the first number. Any new modes or methods showing merit and originality upon any trade or calling, will receive a hearty welcome and a most careful consideration by the Editor of Work.—F. P.

Mixing Paints.—E. L. (*Preston*).—To mix, say, one pound of ordinary oil paint, take about 8 oz. of the colour pigment you intend using: thus, white lead for white, light greys, pinks, cream, etc., Venetian red, or vermilion, for red, and so forth, according to price and colour desired (see "Plain and Decorative House Painting" papers, pp. 450—51, etc.). Add to this 8 oz., about two more of patent paste or liquid driers; then make up to one pound with either linseed oil, or oil and turpentine, in equal parts. Remember, the more oil the more driers is advisable, but never less than 1 part driers in 8 or 10 of entire bulk. If you only want casual pounds of paint, that sold ready mixed at prices from 3½d. to 5d., according to district and maker, per lb., would be cheapest, and should do for common inside work. You would not be able to make a single pound so cheap, and some of the colours sold—bright red, for instance—you couldn't make at twice the figure. If varnished they stand a lot of wear. For cork picture frames buy varnish stain, either oak, walnut, or rosewood, stain and varnish combined, and it dries quickly. Colour for bedroom suite would depend on personal inclination; study the painting articles, or write when you have decided as to style. Frame making is in hand.—F. P.

Repairs to Verge Watch.—H. (*Brighton*).—In reply to your query, read over again the part speaking of repairs. I say "see last chapter," not "previous chapter," one gone before, but last one at end of the chapters on watches. You must know first how to take to pieces and clean before repairs. For me to begin the papers with repairs would have been folly.—J. S.

Verge Watch Cleaning.—W. G. B. (*Handcross*).—The putting in of verge staff is above the amateur's capabilities; the tools and time would be more than the cost of a pullet staff to balance; place the broken part in a small box so as to have same size inserted, and send on to Morris Cohen, watch tool, etc., maker, 132, Kirkgate, Leeds. Attach a label with above address, so that the P.O. people will only stamp on it, and not injure your new balance staff. He charges most reasonably, and I have no doubt you will be satisfied. You see you could not make one, so you might as well have it put in, costing very little more.

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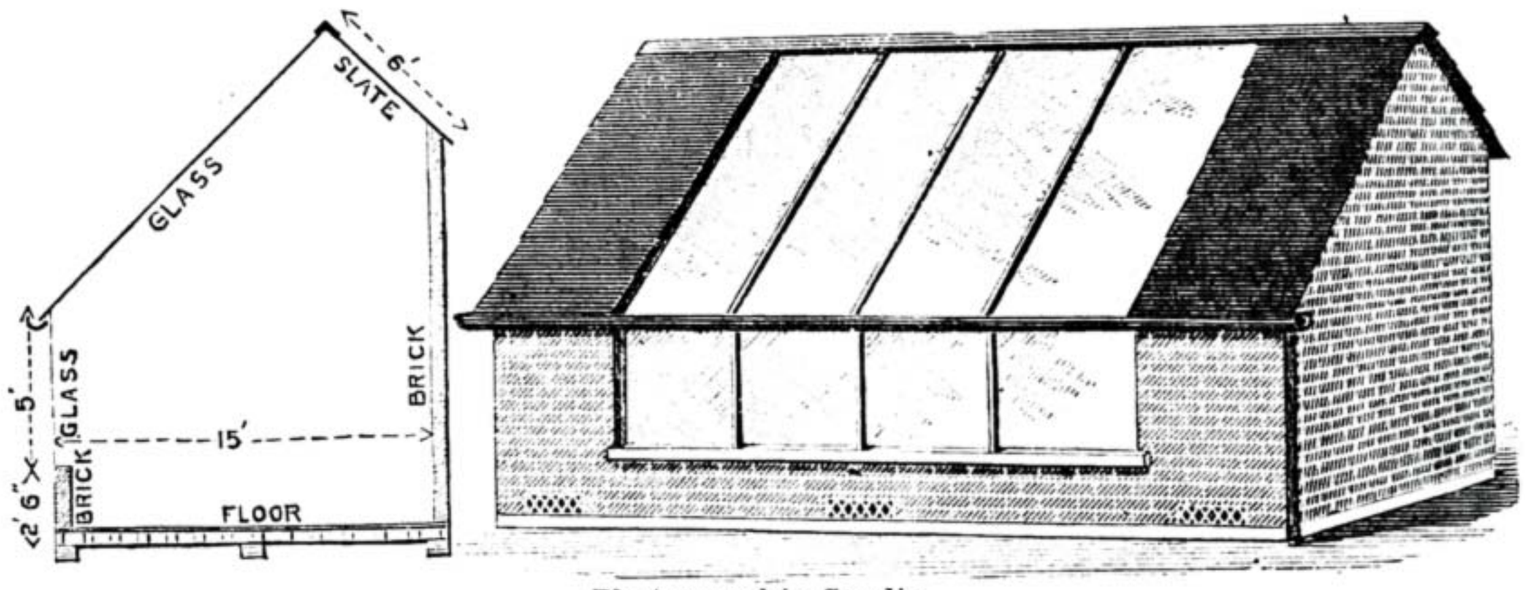
Stereotyping.—A. W. (*Paisley*) pours in a string of questions which space precludes our answering fully, prefacing them with an interesting account of his experiments in stereotyping. We note, however, that A. W. either omitted a very important factor in his process, or else omitted to mention it in his account of it. We refer to what the French call "pâte," or paste, consisting of flour paste, with a good proportion of plaster of Paris, and a little glue; layers of this paste harden in the drying, and render the matrix solid behind the flong and between the sheets of tissue and that of the wrapper paper. (1) As to curling, we advise A. W. to dry the matrix thoroughly whilst still on the forme and under pressure. We think this will prevent warping; and in putting the matrix into the casting box the side bars should lie on the beard, or margin, of the matrix, so that when screwed up the matrix should be held tight to the back plate, whilst the bottom bar should hold it tight transversely. The weight of metal as it is poured into the box should force the intermediate portions of the matrix back against the plate. (2) Any means of gradually drying matrixes cannot be objectionable. (3) Papers on photo-typography have been invited and received, and are under consideration. (4) To give in detail the process of producing a phototype would occupy too much space except in the article above referred to. In Wyman's Technical Series is a volume which A. W. should read, entitled "Zincography, or Process-block Making," by Josef Bock, 2s. 6d., 65, Chancery Lane. (5) We are quite unable to state whether you can claim to be the first to use blotting paper in stereotyping, but we should think not, as the papier-mâché has been thoroughly threshed out years ago. In conclusion we would point out that cuts, by which we presume wood engravings are meant, should never be stereotyped by this process, which, in the first place, is not nearly fine enough to reproduce their sharpness, and is unfitted by reason of the dampness necessary in the first stage and the subsequent heat of the second stage (which must split any wood up into numerous pieces) for the purpose. Electrotyping is now so cheap that stereotyping, either cuts or zincos, is quite out of date. Formerly they were done either by the polytype process, or with plaster matrixes. The former process consisted in first striking the block into type metal in the waxy state between fluidity and solidity which it, during cooling, attains, and as rapidly withdrawing the block before the heat has time to burn or crack it. The matrix thus made was used to strike any number, hence its name of stereotypes. It is now never resorted to, electros having quite beaten it out of the field, one valid reason being that in colour work the contraction in cooling that type metal exhibits utterly upsets all register.—J. W. H.

Ebonising Pine.—A. J. (*Glasgow*).—The greenish shade of which you complain may be owing to bad stain, or it may be (probably is) owing to a vegetable black having been used with brown polish. However, by adopting the following process you ought to be able to get a perfectly jet black surface either bright or dull. Of course, if the grain rises you must paper down. Mix some black with ordinary glue size, and apply to the wood. The mixture acts both as filling and stain. For the polishing medium use white polish and gas black mixed. Finish in the usual way with spiriting for a bright surface. To dull down use fine emery powder poured on. I am of course assuming that you are acquainted with the ordinary routine of polishers' work, so have not gone into minute particulars.—D. A.

Wooden Swing Cradle.—FRANÇOIS (*Dulwich*).—I have the construction of a child's cot on my list of subjects, but I am afraid it cannot appear yet awhile. However, as the matter is urgent, the following hints on the construction of a swing cot may help you. The cot itself may measure about 3 ft. 3 in. by 1 ft. 8 in. by 1 ft. 3 in. deep. This is slung between two uprights by means of a couple of rods, of which one must be fastened to the foot, the other to the head end of the cot. In these days of cheap iron bedsteads you will find it much less costly to buy one ready made, and it does just occur to me that, however proud your wife might be of your swing cot, she, and perhaps you, would hardly care to trust your firstborn in it. I don't want to hint that you could not make the cot safe—safe enough, say, for the second—but the first is really such a precious little being, and in every other way superior to any previous youngster, that your wife might prefer a cot of somebody else's make. Instead of making a swing cot I think it would be safer to confine yourself to making a cradle on rockers. Some of this advice perhaps is not definitely asked for, but it is founded on experience. Somebody else for a time had an only baby, for whose use something was made by *pater*, who thought, like you, that *mater* would be pleased. She was, but baby used something else—very similar, but not *entre nous* home-made. Glad you like WORK.—D. D.

Platform for Stage Purposes.—J. H. (*Liverpool*).—You cannot do better than make your platform of ordinary flooring boards. On account of the size make it either in two or in four parts. A drop scene will be much better than a screen to shut off the stage, but possibly the room may not admit of the necessary fitting. The entrances to the conservatory could easily be hidden by a judicious arrangement of curtains. If you cannot drive nails into the walls the difficulty would certainly be increased, but by a little contrivance you should be able to effect your purpose. For example, uprights could be fitted to the front corners of the stage, and a rod supported by them would do for a pair of curtains. These could be made to be drawn from the sides without trouble. Side curtains and a couple of screens would then hide the conservatory doors. I do not know if all the hints you want are now given, but I fancy from your letter that you have your "head screwed on," and will be able to see how to arrange details. Of course, it is always difficult to give precise directions for these unless one has seen the room, but if I am right in supposing the one you refer to is near Prince's Park, you will not need anything very complicated.—D. D.

Photographic Studio.—B. B. (*Holywell*).—Usually a photographic studio has to be constructed in accordance with conditions of light available, regulated by surrounding buildings, etc. The most usual form is the ridge roof studio, and this is one in which most excellent work may be made. We will presume that you have an open space with uninterrupted light. The following diagrams will give you an idea of its construction. The glazed side should face north, and the length of the room be about 30 feet, with about 20 feet to the highest point of the roof, and 15 feet wide. Six feet from



Photographic Studio.

each end should be brickwork, with a slated roof in which ventilators are placed, and ventilators at intervals near the ground. Access is gained by a doorway in the brick wall on the south side. Backgrounds at each end. Some photographers prefer to carry the glass roof in an uninterrupted slope to the solid low wall on the north side on account of greater facilities for fixing blinds. The lighting in both cases is identical. A series of working drawings for a studio would occupy too much space for these columns. The floor should be made as free from vibration as possible, and if erected on the ground should be on low brick pins about 6 inches above it for dryness' sake. A steep pitch to the roof tends to prevent leakage of rain and protection from hailstorms, and also improves the quality of the light. These are the principal points to be attended to in the construction.—E. D.

Emery Wheel.—A. H. (*Manchester*).—Directions for making emery wheels at home were given in a paper in WORK, August 31st, page 370, but if you require only one wheel it would hardly be worth while making it yourself, as wheels of all sizes are easily got and are not expensive. For most amateurs' work, a wooden wheel with leather rim covered with emery powder answers very well, and possesses one advantage over solid wheels, viz., that it may be renewed when worn, and also does not choke. The best wheels require to be faced up from time to time, as the pores of the material of which they are composed get stopped, and the cutting surface becomes glazed. Of course, if you require the wheels for grinding edge tools, the wooden, or buff, wheel will not suit, as it does not admit of the use of oil or water, and your only course is to purchase a wheel or make one as directed in the paper alluded to.—OPIFEX.

Chest of Drawers.—F. W. A. (*Forest Gate*).—To give detailed directions for making a chest of drawers would be little more than to recapitulate the instructions for making the lower part of the bureau. As you have the back numbers of WORK, you will be able to refer to them. If you want to thicken up the top, read also the article on "Lining Up." I do not think you will find any difficulty, apart from that inseparable for a novice, in making a chest of drawers. In case you may not know how to fasten the top down, I may as well say that you must make what may be called an inner top which connects the ends, and screw the top down to it. As a rule, this inner top takes the form of two pieces of board, one at the front and the other at the back, widened out at each end. If this construction is not quite clear to you, it will be found more fully described in a paper which will appear shortly, giving directions for making a kitchen dresser. The tool you inquire about is a very comprehensive one, and no doubt will do all that is claimed for it, but I must say I am not altogether in favour of such things. For you as an amateur it may do well enough, but a practical workman would find the loss of time in altering from one arrangement to another too great to compensate for the undoubted saving in prime cost. I cannot speak from personal experience of the tool's durability and stability, but so far as I can form an opinion I do not think you need have any fear about them. I am glad to hear WORK has been so helpful to you. I have no doubt you will find as you make progress that working in wood is not only an agreeable but very useful "hobby." You have evidently an aptitude for it, and your success ought to be an encouragement to other beginners. Apply to "Shop" for anything you want to know.—D. A.

Moulding.—MITRE (*Peckham*).—The man you saw cutting a mitre probably set it out, or, as you say, made certain lines with a pencil as follows: Down the back a line was run by the square, the wood block either on the top or bottom of the moulding. On the top another line would be marked with the aid of the bevel. This would give the direction or guide for the saw, and might be sufficient for an expert. I do not, however, wonder at your not having succeeded in making a good mitre by this means, for at best it is but an unreliable method. The man you saw do it must either have had great confidence in his skill, or not had a mitre box by him, or was not particular about getting a perfect mitre. Possibly he put the moulding in a mitre trap after he had sawn the ends in order to true them up. You will understand I do not say he was doing wrongly, for the probability is that as an expert he would know the best course to adopt in the particular instance named. It is not, however, a plan I could recommend you, nor indeed any one in a general way, to adopt. You will find it much better to use the mitre box mentioned in an early number of WORK in connection with "Artistic Furniture" (overmantel), and if necessary trim up with the mitre trap. A separate paper was devoted to the construction of this. Yes, you are quite right. The great bulk of amateurs are workers in wood.—D. A.

Letter "B" in Sign Writing.—H. P. (*Plaistow, E.*).—I have not yet had an opportunity of seeing the letter "B" in No. 31 of this Journal, and even if I had, it would ill become me to speak of a fellow contributor's work in a disparaging sense. Nevertheless the specimen "B" you have submitted is correct in formation. I am glad the articles on "Sign Writing" have proved of some little use to you, and I thank you for the information *re* ticket-writer's ink, about which I have received a large number of inquiries.—H. L. B.

Books on Illuminating.—G. E. (*Liverpool*).—There are many works published on this subject. Some good ones are as follows:—(1) "A Primer of the Art of Illumination," by De La Motte (price 9s.), coloured plates; (2) "A Practical Treatise on the Art of Illumination," by Marcus Ward, Illuminator to the Queen (2s.), coloured plates; (3) "A Guide to Illuminating and Missal Painting," by W. and G. Audsley (2s. 6d.), coloured plates; (4) "A Practical Manual of Heraldry and of Heraldic Illumination," by G. J. Baigent and C. J. Russell (6s.), coloured plates; (5) "Art of Illuminating as Practised during the Middle Ages," etc., by Henry Shaw, F.S.A. A second-hand copy may be had for about 25s. from B. T. Batsford, 52, High Holborn, W.C., who has many other books second-hand on same subject; write for catalogue. John Calvert, 99, Great Jackson Street, Hulme, Manchester, will send you the first four post free at prices named above. He also issues a capital technical catalogue, price 6d. Get it by all means.—H. L. B.

Electric Lighting without Engine.—K. C. B. (*Darlington*).—Yes, electric lighting can be done without using an engine and dynamo machine. It may be done by means of batteries, but at what a cost and trouble! You do not give the height of your workshop—this must always be given in addition to the superficial dimensions—but, assuming that it is 12 ft. in height, then a room 20 ft. by 16 ft. by 12 ft. will take four 16 c.p. lamps, at a height of 8 ft. above the floor, to effectively light it. To supply current to these from a battery you will need at least 30 cells of a double fluid, chromic acid type, each having not less than 2-gallon capacity, and costing about 8s. per cell. The acids to charge each cell will cost nearly 1s., and the battery will need recharging every evening. The time taken up in charging the battery, and cleaning it, cannot be less than 4 minutes per cell, or about 2 hours

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each day. For further information await my article on "Model Electric Lights."—G. E. B.

Morse Telegraph Instruments. — T. E. (*London, S.E.*).—We have not yet published in WORK instructions on making and working Morse telegraph instruments, but these shall receive attention when we are writing on the subject of telegraph instruments.—G. E. B.

Zinc Palettes for Sign-Writing. — J. L. (*Walworth, S.E.*).—No chemical action would take place between the colours and the zinc, but why not beg some thin pieces of mahogany from a cabinet maker, and make a palette or two with it, according to the designs shown in my articles or any colourman's catalogue? A wooden palette is much better than a zinc one, and the latter would cut the thumb and fingers I am afraid. I am glad you have made practical use of the elementary papers on "Sign-Writing," and made a blackboard and an easel from the designs; you are going the right way to work in commencing there. I will endeavour to give you some more advanced alphabets shortly. In the meantime keep repeating those already given.—H. L. B.

Wood for Cupboard. — AMBITIOUS HEIGHT (*Cornhill*).—From what you say of the cupboard you intend making, I think you will find the following thicknesses appropriate. You must chiefly bear in mind that the stuff must not be too thin, and that anything more than is necessary is so much waste, unless indeed appearance is considered to be improved by extra thickness. If it be, you can get the same result, that is the appearance of a very massive job, by lining up the top, and putting a pilaster on the front edges of the ends. If you adopt the latter form, the doors must be hinged within the ends, and not as shown on your sketch. Taking this, however, as given 1 in. or 1¼ in. stuff for ends, top and door frames will do very well. Thickness of shelves must depend on the weight of the things to be placed on them, but 1¼ in. stuff ought to be ample. For door panels use ¾ or ½ in. stuff, and the same for the back. muntins, if any, being proportionately thicker. The plinth may be of ¾ in. stuff. If the cupboard is well made of good clean pine the figure you name is not excessive, but I think it is quite high enough. So much, however, depends on the quality of the workmanship, etc., that without seeing the job it is impossible for me to state its value. It might not be worth 15s., while, on the other hand, it might not be dear at 40s. Glad to hear you "are more than pleased" with WORK.—D. A.

Preserving Books from Insects.—BOOKWORM (*Gloucestershire*).—To *destroy* insect pests, powdering the shelves, and, if necessary, the bindings and books themselves, with finely-powdered burnt alum and pepper has been recommended; the "Insect Destroying Powder," sold as such, would answer the same purpose. To *prevent* their ravages, it is held good to wipe the shelves, and even the books also (two or three times a year), with a cloth steeped in a solution of alum and afterwards dried; or with a flannel in which some white birch bark has been kept. Birch bark contains a powerful essential oil, the smell of which is highly obnoxious to insects, hence the above; hence, also, the recommendation to have some books on your shelves bound in "Russia" (Russian leather is tanned with birch bark), or to lay scraps of this leather on the shelves behind the books.—M. M.

Melting Rubber. — J. W. (*Bolton*). — Melted indiarubber — *i.e.*, indiarubber liquefied by heat alone—cannot be employed for the construction of articles, as it always remains soft and gummy. It may be used for certain purposes in solution, the solvent used being either bisulphide of carbon (which is probably the substance referred to by the querist), mineral naphtha, benzole, or caoutchoucine; but a solution of rubber is not adapted for use in any case where the sharp outline of the mould has to be preserved, owing to the enormous contraction brought about by the evaporation of the solvent. Sheet rubber (pure, not vulcanised) may, however, be greatly softened by prolonged exposure to the vapour of petroleum or benzoline in a close vessel, either with or without the aid of a moderate degree of heat, and in this state will readily conform to the form of moulds not too irregular in shape. If used in this state, pressure must be applied and maintained until the petroleum or benzoline absorbed by the rubber has been evaporated, the time needed being much lessened by using porous moulds if practicable, and placing them with the rubber inside in a current of warm dry air. But the most generally useful method is to use vulcanised rubber, the vulcanisation being effected under pressure in the mould. No precise instructions which will meet J. W.'s case can be given without a knowledge of the exact object in view, but if J. W. will supply this information, in strict confidence, through the Editor, I will endeavour to help him over his difficulty. —QUI VIVE.

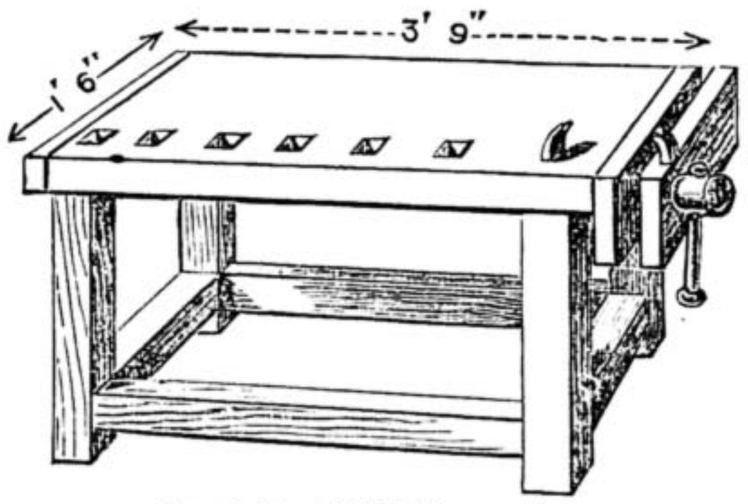
Learning Marbling, etc.—W. H. (*Newington Butts*).—The best answer to your query, "Where could I learn graining and marbling at a small cost?" I can make is to advise you to await the publication of the papers in WORK upon this branch. For small cost of tuition, and with this recommendation, that also of practical usefulness, these papers will, I believe, distance any other letterpress lessons upon the subject now published. In any case you will have to devote a large amount of time and patience to it. There are, of course, various other ways open to you—for instance, a course of practical lessons from a clever marbler, costing from two to five pounds a term, or the purchase of a very good existing Dutch work on marbling, published, I think, at £2 18s. Only the litho specimens of this might be useful to you, unless you are a linguist and could interpret the Dutch articles. Hence my advice to you is to wait for lessons in WORK.—F. P.

Electro and Nickel Plating.—J. S. (*Leicester*).—We have not room for the treatment of this subject in "Shop." In future numbers it will be fully dealt with. You may obtain a silver plating and nickel plating outfit for £20 from Messrs. J. E. Hartley & Co, 13, St. Paul's Square, Birmingham. Thanks for kindly words of appreciation.—G. E. B.

Italian Fret Designs.—W. J. (*Edinburgh*).—I know of no fret designs produced in Italy. If you mean those in the Italian style, Mr. Ziller would probably be able to send you those you require.—E. B. S.

Aquarium.—C. M. (*Gloucester*).—I can offer you nothing better for outdoors than the design in No. 31. Instead of ferns, however, I should use ivy in the pots; a slow-growing, non-clinging variety to be found in most hedgerows in England would answer admirably. I find the roots run into the water from central rockwork, and require no attention whatever.—C. M. W.

Slöjd Carpentry.—J. S. (*Hampstead*). — Slöjd, pronounced *Sloyd*, is the name given to a branch of carpentry coming to us from Sweden, sometimes called Swedish carpentry; it is intended to train the eye as to form, and the hand as to uses, of tools. It is being introduced in boys' schools as a beginning or introduction to the carpenter's workshop, and also in schools for young ladies. The work mostly consists of articles made from models (which models are generally very nicely made), so that the learner has to match an object by the use of his hands and eye. The tools usually employed are certainly not



Bench for Slöjd Carpentry.

of the very best quality, or, at least, those I have seen, and this is accounted for by the very low price at which they are sold. The bench is somewhat different from the ordinary one, and is something like above design, and the work is all done from the right-hand end of the bench, similar to the German pattern bench. It is made of deal, and its cost is about eighteen shillings only. Messrs. Syer & Co., of 45, Wilson Street, Finsbury, E.C., make this bench, and supply all the tools necessary, and I should recommend any one requiring these to apply or write as above, where I feel sure they will receive every attention to their wants. I may add the knife is the tool mostly employed in this work.—F. J. S.

Iron Oil Drums.—J. H. & Co. (*Liverpool*).—Oil mill machinery is made by Messrs. Greenwood & Batley, Leeds; Manlove, Alliott & Co., Nottingham; Rose, Downs & Thompson, Hull.—J.

Gesso Work Materials.—J. N. B. (*Halifax*).—Gesso materials are to be obtained at the depôt of the Society of Artists, 53, New Bond Street, and the metallic colours for tinting the gesso work also.—E. C.

Slide Rule.—SLIDE RULE.—Some information on the Slide Rule, to be of any value, would have to extend into several articles. "The best engineer's rule" is, of course, that which is most comprehensive. Of these there are many, and the choice in any particular case must be made according to special requirements. There are, at least, a dozen, and those which are most expensive are the most comprehensive, and therefore the best. For workshop use a rule costing 4s. 6d. is suitable; the best will cost a pound or more.—J.

Short Distance Telephone.—G. C. (*Morpeth*).—Surely G. C. has not been reading his numbers carefully, or he would not have sent this query. The telephone was fully described in No. 28 of WORK. If you will turn up that number and follow the instructions there given, you will find the instruments suitable for your purpose. If, however, you find any difficulty in making these instruments, I will be pleased to help you through "Shop."—W. D.

Indelible Ink, Indian or Chinese. — J. N. (*Bowes Park*).—You have asked a question which is very difficult to answer for many reasons. In the first place, the manufacture of the indelible Indian inks sold by Rowney and other firms are trade secrets, and there can be no doubt their receipts are the best. Again, pure Indian ink, which is really Chinese, is a most expensive article, the best costing as much as 25s. per stick, so I do not see how you are going to make half a pint of indelible ink with the real article any cheaper than you can purchase it ready for use. Please note, the best Chinese ink will never rub up when washed over with water; it is only inferior sorts and imitations that do so. Here are some receipts; whether they are indelible or not I must leave you to prove: (1) Dissolve horn strip with caustic kali root till it is melted. This brown liquid is to be boiled in an iron kettle until it is thick. Then pour on it boiling water, double its weight, and precipitate it with dissolved alum. Dry, grind, and mix it with gum-water, and pour it into a mould. A few drops of essence of musk, or of ambergris, may be added as perfume. (2) Mix finest lampblack with a solution of 100 grains of lac, with 20 grains of borax and 4 oz. of water. (3) Pure lampblack, mixed with asses' skin, glue, and scented with musk. Regarding No. 3, it is a well-known fact amongst photographers that animal glue when treated with bichromate of potash, and exposed for some time to the sunlight, is insoluble in water. Impure Indian ink (by analysis) contains such animal glue, so if a small quantity of bichromate of potash be added to it, it should prove indelible after being exposed for one hour to sunlight. I advise you to try a 6d. bottle of Stephens's ebony stain. It is now largely used in place of Indian ink. It is cheap enough for the purpose—8s. per gallon, from Henry Stephens, 191, Aldersgate Street, E.C. It is very black, and works well with pen and brush alike.—H. L. B.

A Baker's Oven.—BAKER (*Blairgowrie*).—I do not see clearly how I can help you, unless you give more particulars. Correspondents would save us an endless amount of trouble and thought if they would only give full explanations. You ask for advice concerning an oven that will bake a loaf or two at a time, and give as requirements that it shall be simple, easily erected and removed. An oven constructed as bakers' ovens usually are clearly would not answer this requirement. I cannot see that you can have anything better than an ordinary cottage range with a good-sized oven, or a powerful petroleum stove. Without further information as to your intentions as to price, kind of fuel available, whether to be made by yourself, etc., I cannot advise you farther.—R. A.

Brazing.—PAUL JONES (*Kentish Town*).—From the wording of your letter I suppose it is bicycle fittings that you wish to braze. This to the ordinary workman presents no difficulty. The main thing is the fitting of the parts together; the joints must fit tightly, and not only tightly but accurately, for a joint might possibly be tight and yet only bear in two or three places owing to unequal filing. It is a very true saying that there is very little difference between a fit and a "wobble." Presuming that you are able to fit the parts together "well and truly," you will, I trust, after perusing the following, make a good job of the brazing part of the process. A Fletcher's injector pattern gas blowpipe and foot-blower would be the best thing you could use for the purpose. It gives a great heat, and can be used in any position, and is clean and manageable, but if you do not possess one, and are limited to a forge, proceed as follows:—Build your fire so that you have room to manipulate your work—that is, bring it well out into the centre of the hearth by means of a pipe, if necessary; blow up a fire of charcoal or coke—I prefer coke myself—let the fire be perfectly clear and free from smoke; this is very important, for if any smoke gets round your joint it is certain to prevent the spelter running in as it ought to do; pound up some borax very fine; in a tin or some convenient article mix about two teaspoonfuls of spelter and one of borax to a paste with water, and have some of the powdered borax ready to hand; place the article to be brazed on the fire and blow gently; when it gets a bit hot dab on some of the mixed spelter and borax with an iron spatula. It will fizz and rise up off the work, and then sink and adhere closely to it. Now blow gently, and gradually increase in force; as it gets red-hot, sprinkle a little of the powdered borax on the joint; keep blowing till you see the spelter run, then rub it with the spatula; add more spelter if necessary, and when all seems well run, give a final sprinkle of borax, cease blowing, and after a minute gently remove from the fire, and allow to cool of itself. On no account cool it with water. I advise you as an experiment before doing your tubes to try brazing two pieces of iron pipe—say, a piece of ¾ in. gas barrel into a piece of 1 in. gas barrel; it will give you practice, and show you what to do and what to avoid.—R. A.

Violoncello Case. — S. E. T. (*Glasgow*).—With the Editor's permission, I will communicate with you per post. I think I shall be able to assist you — B. [Kindly send information through me—*pro bono publico*.—ED.]

Bazaar Ideas.—BAZAAR (*Skipton*).—We might, by way of novelty, suggest "An Automatic, Infallible, Moral, and Intellectual Balance." Its professed use would be to ascertain with exactness how much of any good or bad quality might be possessed by the visitor. For instance, a lady whose "constancy" is to be tested takes her place on the scale. The attendant (who might be dressed as a necromancer) would put such weights as he thought proper on the opposite scale, and it would go down; the scales, of course, being really controlled by a confederate, either placed behind a curtain or in a large pillar through which the beam works. The fun of the thing must largely depend on the humour of the attendant; and capital could be made in such cases as that of a lady well known to think

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herself good-looking, who might be shown to have, by the balance, not half an ounce of beauty; or that of a man reputed to think himself clever, and yet whose record might show no more than a few grains of wit. We imagine that a little thought will show how this idea may be worked out successfully.—M. M.

Materials for Painting.—W.C. (*London, N.W.*).—The queries shall be answered seriatim:—(1) The brushes used in oil painting are chiefly hog-hair and sables. The size used must depend on the work. A flat hog-hair, ¼ in. wide by ¾ in. long, is one of the most useful; very useful also is a rather smaller size in sable. For painting skies on a fair-sized scale, a somewhat larger hog-hair becomes necessary. Flat brushes are more useful than round ones, as they give greater variety of touch. The "sweetener" is properly made of badgers' hair, but, if the cost of this be a consideration, a cheaper large, flat, camel-hair will answer the purpose. (2) The mediums used and sold for mixing with the colours are various. A good and inexpensive one is gum dammer dissolved in turps. This gum may be got at any large chemist's at 1d. or 2d. per oz. Put the gum in a bottle and pour on turps to an inch above it. When dissolved, strain. Thin, if required, with more turps. (3) Prepared boards may be bought at any good artists' colourman's. (4) The paper stumps alluded to are doubtless for crayon and charcoal drawing. The large artists' colourmen, such as, say, Winsor & Newton, Rathbone Place, Oxford Street, W.C., issue illustrated and priced lists of all materials and appliances sold by them. W. C. should apply for one of their lists, which will give him much of the information of which he stands in need. A considerable discount is allowed to artists off list prices.—S. W.

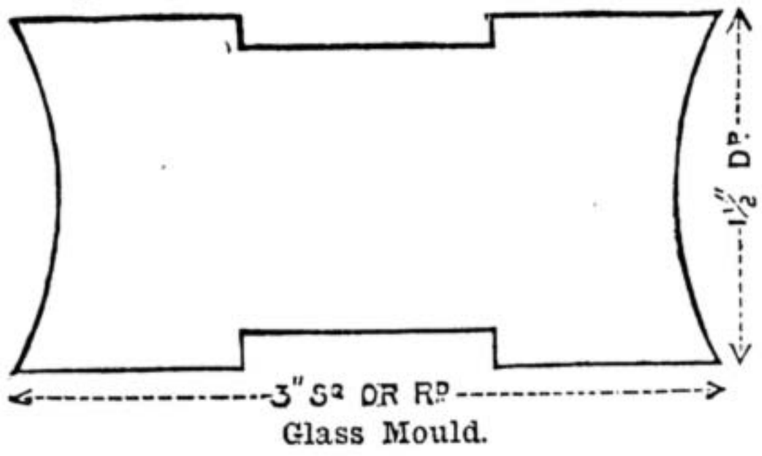
Cabinet in Fretwork.—H. H. (*Manchester*).—For a novice as you are in fretwork—although being skilled in the use of tools, you would probably succeed better than an ordinary amateur—I should not advise you to try the cabinet design issued with No. 1 for your first work, chiefly because it involves more labour than most pieces of its size, and unless absolutely well done would fail to be effective. Why not try the coffee table design in No. 30, or the little paper tray in No. 21? The design for an overmantel in No. 2 might be ornamented with some of the Japanese motives in Nos. 9 and 14. For instance, some of the storks (Figs. 3 and 4), or the other birds, might be cut in thin panels of the doors; the pattern of the paper tray on page 328 might be adapted for a cornice rail. If neither of these suggestions meet your wishes, there are two or three designs to appear shortly that will, no doubt, fully do so. For inlaying, the simplest way is, perhaps, to cut the pieces carefully out of a thin sheet of light wood, then to stain the portion from which they were cut, and replace them. Of course, the pieces themselves may be dyed various colours (with Judson's dyes) to simulate real marquetry, if you care for that effect. Another plan is to paste two thin layers of different wood together with a rather thick piece of brown paper between. Cut carefully with a fret saw, and reverse the pieces; thus if walnut and white holly be chosen, you will obtain a light pattern on a dark ground, and *vice versâ*. Bemrose's publish a book on Buhl Cutting and Inlaying; but so far as my memory serves, it was not particularly useful to me; perhaps others would find it all they wished.—E. B. S.

Gasalier Fitting.—G. S. (*Clapton*).—The first and most important thing to be done in taking down the above, is to turn off the gas at the meter, then take off the globes and triangles, next the weights, and you will then find that the outside stem with the arms, and a small inner tube attached, will draw off, or, if you are not careful, fall off. Take this down steadily, and pour out any water you may find inside. You will now notice that a single pipe remains connected at the top with a ball and socket joint; undo this joint; and all you have now to do is to unscrew the ceiling plate. If in doing the latter you notice how it is fixed to the ceiling, and how joined to the compo pipe or gas barrel above, you will have no difficulty in refixing it in any other position, and a little consideration after you have it down will at once show that the water is necessary to make the sliding joint gas tight. The only other thing of importance to do, is to be sure you pour some water in the top of the stem after you have refixed the whole before you turn on the gas. A practical gasfitter would not take the whole thing to pieces unless it was very awkward, but would unscrew it from the ball and socket joint, after removing the globes. But if you go step by step as I have described, you will understand better what you are doing. Again, let me remark, be sure not to turn on the gas before you have made the sliding joint gas tight, by pouring as much water as the stem will hold, without running over, when the gasalier is either up or down.—E. D.

Photographic Studio.—F. T. R. (*Retsbyl*).—Before the form of a studio can be decided upon, the surroundings must be taken into consideration. Good work can be done either in "lean-to" or detached glass rooms, the size and form being regulated in a great measure by the amount of money to be spent upon them, and space at disposal. The following leading conditions are generally considered imperative to good work of the usual kind:—The length of the studio should not be less than 20 ft., the width and height 12 or 14. An unobstructed north light tends to uniformity in results, on account of its freedom from direct sunshine and a generally more even illumination; a clever operator will turn out good work from a studio with any aspect. The cheapest form is the lean-to, as one side is supposed to be already built. The most convenient is the ridge-roof detached studio. It is impossible, in the space at disposal in these columns, to give full directions for building one. To sketchily describe a ridge-roof one, begin by laying down a framework the size of the area of the building, supported 12 or 18 in. above the ground on brick piers; for dryness' sake board it over with stout planks supported on battens a foot apart, and made as free from vibration as possible; on this erect the framework. Board up both ends, and about 6 feet of each side from the ends, supposing the studio to be rectangular, with a ridge roof, and one side and one half the roof may be opaque, the rest glazed; a door or doors being made on the boarded-up side, the glass is put in on the ordinary greenhouse plan, each pane overlapping the one below it; good colourless 21-oz. glass is best. The interior may be canvased and papered, and a background on roller at each end. The more steep the pitch of the roof, the less liability to leakage and accident from storms. There have already been published many designs for building glass rooms, which F. T. R. would do well to consult. A cheaply-made photographic studio is little different to a greenhouse in putting together. The fewer the sash bars and better the glass the more light. Provision must be made to ventilate it well, or unless this is properly managed the heat in summer is almost insupportable; it goes without saying that the larger the place, the more comfortable it is in this respect. F. T. R. will do well to consider the comfort of his customers in the construction almost as much as other conditions.—E. D.

III.—Questions Submitted to Correspondents.

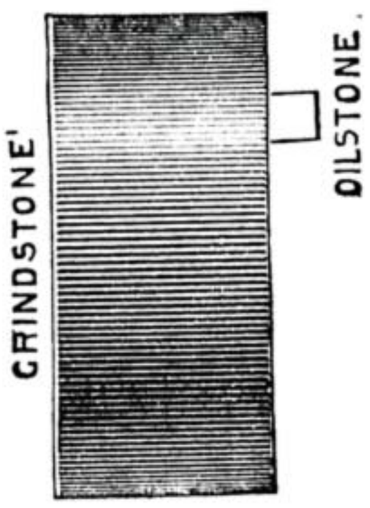
Toughened Glass.—One in a Fix (*Tunbridge*) writes:—"Would any reader give me a few practical hints upon toughened glass making, also what kind of pot and furnace is used for small work? I want to make a few articles of great strength in solid glass pressed to shapes required for experimenting. I believe the moulds are cast iron and made in parts. How are they fastened together to stand the pressure? What is required to make the mould leave the rough sides of glass? A sketch of parts wanted will greatly oblige. I enclose rough sketch. I want them round and square."



Glass Mould.

IV.—Questions Answered by Correspondents.

Rubbing down Oilstones.—Brum (*Keighley*) writes in reply to A. G. (*Newcastle-on-Tyne*) (see page 619):—"About the easiest way of rubbing an oilstone down is to hold it against the side of a revolving grindstone, using plenty of water."



V.—Brief Acknowledgments.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—Boiler; W. R. S. (*Brixton*); H. A. C. (*Plaistow*); A Wood Carver (*London, W.*); Waterproof; W. E. R. (*Southgate*); C. T. (*Kent*); Semper Parare; C. N. (*Yeovil*); J. W. (*Ashton-under-Lyne*); E. W. (*Sheffield*); T. E. B. (*Hants*); F. H. (*Streatham Hill*); R. D. (*Millwall*); J. H. (*Manchester*); M. G. (*Glasgow*); J. P. (*Stalybridge*); C. S. T. (*Camberwell, S.E.*); J. P. (*Reigate*); W. R. (*Nr. Bolton*); F. P. (*Brighouse*); A. S. (*Wolverhampton*); T. D. G. (*Highgate*); Success (*Wolverhampton*); Economic (*Wolverhampton*); N. M. (*Sheffield*); W. E. C. (*Wakefield*); A. F. (*Sheffield*); H. W. (*Newcastle-on-Tyne*); H. T. (*Sheffield*); North-Jack; G. and Co. (*Glasgow*); J. R. H. (*Gateshead*); X. W. (*Crowle*); A. S. T. (*Bishopsgate*); S. A. R. (*South Shields*); R. P. W. (*Walkden*); D McD. (*Paisley*); C. J. D. (*Brixton*); E. J. (*Liverpool*); W. D. (*Newcastle-on-Tyne*); A. S. (*Cork*); T. L. (*Sussex*); Constant Reader; W. H. B.; J. F. B. (*London, E.*); A. M. (*London, W.*); M. M. (*Glasgow*); W. F. C. (*Clifton*); A. S. H. (*London, S.E.*); W. B. (*Huddersfield*); J. H. N. (*Sunderland*); F. B. (*Swanscombe*); J. J. (*Bristol*); H. W. G. (*Bucks*); F. H. (*Leith*); C. S. (*Radford*); W. H. H. (*Bradford*); E. B. (*Derby*); N. W. (*Clapham, S.W.*); E. L. R. (*Oxford*); A. A. (*Coventry*); M. Bros (*Rawal-Pindi*); D. M. W. (*Kelso*); R. M. (*Morpeth*); I. W. B. (*Southport*); G. E. S. (*Berkeley*); J. Y. (*Derby*); H. M. (*Wolverhampton*); R. J. L. (*Salisbury*); G. H. (*London, S.E.*).

Trade Note.

It has been agreed to erect an international monument to James Watt, in Greenock, the illustrious engineer's birthplace. Subscriptions towards the project had been promised from London, and other large centres in Great Britain, America, and other parts of the world. The Greenock Philosophical Society has taken the matter in hand, along with an influential committee under the auspices of the Greenock Town Council. The form which the memorial will take has not yet been decided, but it has been suggested that it should be either a well-equipped technical school in Greenock, or a colossal tower on a prominence which would command the attention of every passing ship on the Clyde.

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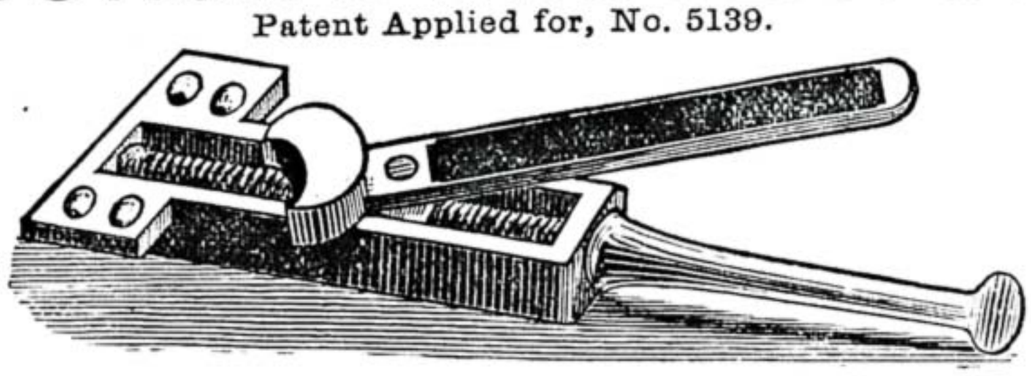

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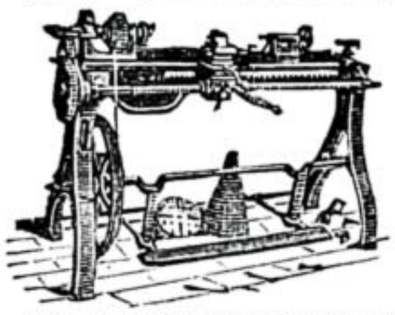

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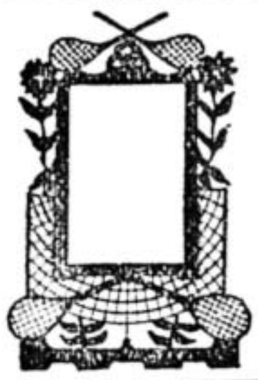

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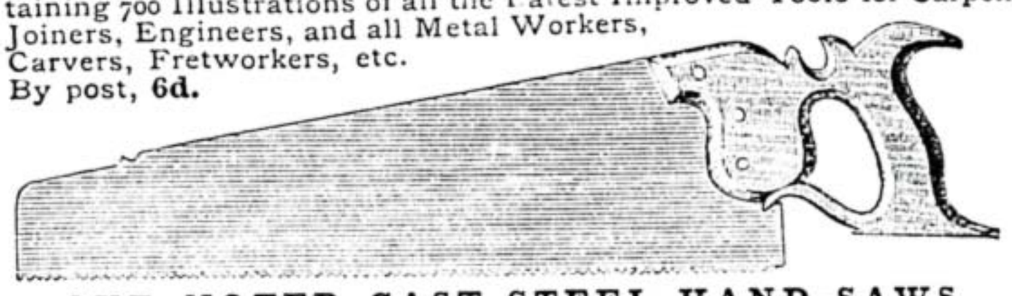

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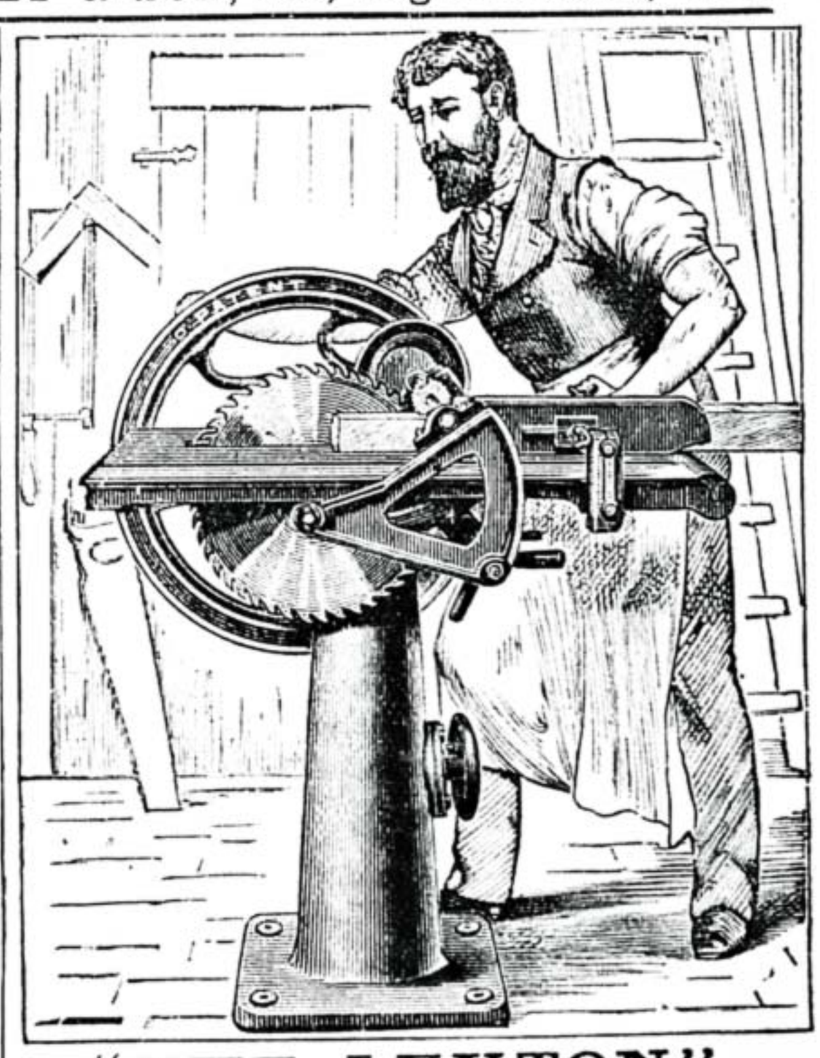

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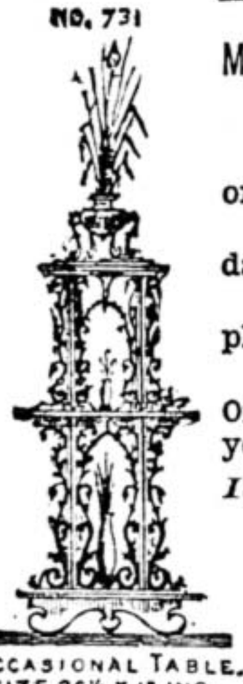

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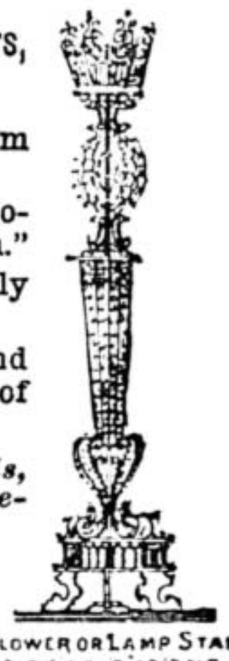

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